

# Oceans in Crisis

## CAN THE LOSS OF OCEAN BIODIVERSITY BE HALTED?

**T**he world's oceans are in a dire state. Large predatory species are being decimated — including sharks, whales, tuna, grouper, cod, halibut, swordfish and marlin — and replaced by species with less commercial and nutritive value. In fact, a growing body of evidence suggests that the world's marine ecosystems have been altered so dramatically they are undergoing evolution in reverse, returning to a time when algae and jellyfish dominated the seas. The crisis is having an increasingly profound effect on humans. Fishing cultures from Newfoundland to West Africa are vanishing, and toxic algal blooms have closed beaches and recreational areas from Florida to the Black Sea. The damage is being caused by over-fishing, climate change and destruction of habitat due to coastal development and pollution. Scientists and policy makers widely agree that a broad-based approach known as ecosystem-based management would help restore the oceans' productivity, but significant research and strong international cooperation are needed to bring about such a shift.

Discarded fishing line entangles a sea turtle — one of an estimated 1 million turtles, seabirds and marine mammals that die each year after ingesting or becoming entangled in ocean debris.



## THE ISSUES

- 239 • Are humans destroying the oceans?  
 • Is ecosystem-based management the solution?  
 • Should ocean-floor trawling be banned?

## BACKGROUND

- 248 **Run on the Banks**  
 Industrialization helped deplete rich fishing areas.
- 251 **Stocks Crash**  
 Some fish stocks plummeted as fishing fleets expanded.
- 252 **Shifting Baselines**  
 Damage is worse than previously estimated.
- 253 **Climate Change**  
 Global warming harms marine ecosystems.
- 254 **Governing the Seas**  
 Countries control 200-mile "exclusive economic zones."

## CURRENT SITUATION

- 254 **Government Responses**  
 Fisheries are being closed, privatized.
- 255 **Zoning the Sea**  
 Some countries have established marine reserves.
- 256 **Managing Better?**  
 Local control over fishing grounds can work.
- 258 **Saving the Shore**  
 Integrated coastal zone management is gaining popularity.

## OUTLOOK

- 258 **Out of Mind**  
 Governments are generally ignoring the ocean crisis.

## SIDEBARS AND GRAPHICS

- 240 **Caribbean Corals Are Dying Off**  
 Only 10 percent of Caribbean reefs are still alive.
- 241 **Fish Stocks Are in Trouble**  
 Three-fourths are exploited, overexploited or depleted.
- 242 **Beach Litter Can Be Lethal**  
 Volunteers found 7.7 million pieces of debris.
- 244 **Black Sea's Cautionary Tale**  
 The ecosystem is recovering slowly after sudden collapse.
- 249 **Chronology**  
 Key events since 1905.
- 250 **Whaling Nations Want Hunting Ban Lifted**  
 Japan, Iceland and Norway lead the charge.

- 257 **At Issue**  
 Should the moratorium on commercial whaling be lifted?
- 264 **Voices From Abroad**  
 Headlines and editorials from around the world.

## FOR FURTHER RESEARCH

- 261 **For More Information**  
 Organizations to contact.
- 262 **Bibliography**  
 Selected sources used.
- 263 **The Next Step**  
 Additional articles.
- 263 **Citing *CQ Global Researcher***  
 Sample bibliography formats.



October 2007

Volume 1, Number 10

MANAGING EDITOR: Kathy Koch  
 kkoch@cqpress.com

CONTRIBUTING EDITOR: Thomas J. Colin  
 tcolin@cqpress.com

CONTRIBUTING WRITERS: Brian Beary,  
 Peter Behr, Roland Flamini,  
 Samuel Loewenberg, Colin Woodard

DESIGN/PRODUCTION EDITOR: Olu B. Davis

ASSISTANT EDITOR: Darrell Dela Rosa

WEB EDITOR: Andrew Boney



A Division of  
 Congressional Quarterly Inc.

SENIOR VICE PRESIDENT/PUBLISHER:  
 John A. Jenkins

DIRECTOR, LIBRARY PUBLISHING:  
 Alix Buffon Vance

DIRECTOR, EDITORIAL OPERATIONS:  
 Ann Davies

### CONGRESSIONAL QUARTERLY INC.

CHAIRMAN: Paul C. Tash

VICE CHAIRMAN: Andrew P. Corty

PRESIDENT/EDITOR IN CHIEF: Robert W. Merry

Copyright © 2007 CQ Press, a division of Congressional Quarterly Inc. (CQ). CQ reserves all copyright and other rights herein, unless previously specified in writing. No part of this publication may be reproduced electronically or otherwise, without prior written permission. Unauthorized reproduction or transmission of CQ copyrighted material is a violation of federal law carrying civil fines of up to \$100,000.

*CQ Global Researcher* is published monthly online in PDF and HTML format by CQ Press, a division of Congressional Quarterly Inc. Annual full-service electronic subscriptions for high schools are \$300; subscriptions for all other institutions start at \$450. For pricing, call 1-800-834-9020, ext. 1906. To purchase *CQ Global Researcher* electronic rights, visit [www.cqpress.com](http://www.cqpress.com) or call 866-427-7737.

Cover: Ocean Conservancy

# Oceans in Crisis

BY COLIN WOODARD

## THE ISSUES

Samba has spent much of his adult life fishing for octopus from his home in Nouadhibou, Mauritania, on Africa's Atlantic coast. Fishing from a wooden canoe, he could bring home 160 pounds on a five-day trip — earning \$600 a month in a country where the average wage is only \$200. In 2004, he built a home and bought new canoes; times were good.

Not anymore. "You used to be able to catch fish right in the port," the 39-year-old told *The Wall Street Journal* recently. "Now the only thing you can catch is water."<sup>1</sup>

Today Samba and other fishermen must compete with huge industrial trawlers from Russia, China and Spain. But while Samba pulls his catch out of the sea by hand in plastic traps, a single Spanish vessel dragging a massive nylon net catches 260,000 pounds of octopus on a typical 45-day fishing trip.

Some 340 big foreign vessels fish Mauritanian waters because the government recently sold fishing rights to Asian and European nations that have overfished their own territorial waters. Stocks of octopus, which account for half of Mauritania's fish exports, are declining, and Samba has seen his monthly income fall by two-thirds.

Samba's experience is rapidly becoming universal in the world's coastal regions. According to the U.N. Food and Agriculture Organization (FAO), a quarter of the world's commercial fish stocks have been overexploited or depleted, and about half are fully exploited — meaning fishermen are taking as much as can be reliably replenished by the ecosystem.<sup>2</sup> (See graphic, p. 241.)



Greenpeace/Robert Visser

*A Russian trawler hauls in a netful of red fish on the Grand Banks in the northwest Atlantic Ocean. The world's oceans have lost more than 90 percent of large predatory fish — such as tuna, swordfish and grouper — over the past half-century, prompting fishermen to hunt smaller species. Scientists and environmentalists blame the loss of ocean biodiversity on overfishing, pollution and climate change.*

Moreover, 90 percent of the world's large, predatory fish have been harvested since 1950, prompting fishermen to progressively move to smaller, less valuable species further down the food chain.<sup>3</sup> The shift has triggered the rapid depletion of marine species previously considered unmarketable — such as dogfish, urchins and basking sharks — which in turn has reduced the food available to the surviving stocks of larger species. Small, lower-valued schooling fish like anchovies now dominate world fishery landings.

"We're eating bait and moving on to jellyfish and plankton," says Daniel Pauly, director of the Fisheries Centre at the University of British Columbia, who predicts future generations will associate seafood not with tuna or cod but with simple, gelatinous creatures. "My kids will tell their children: 'Eat your jellyfish.'"<sup>4</sup>

The decimation of global fisheries is blamed largely on powerful, new technologies that allow fishermen to capture fish faster than the ocean can produce them. Radar, fish finders, satellite tracking and navigation systems, onboard processing plants and flash freezers are put aboard ever faster vessels capable of fishing far from shore for long periods.

In addition, most fishing gear is indiscriminate: The vast nets used by trawlers typically kill huge quantities of unmarketable marine life. Each year 7 million metric tons of seabirds, juvenile fish, sea turtles, dolphins, sharks, crabs, starfish, anemones, sponges and other creatures are caught, killed and discarded by mechanized fishing. On average, this "bycatch" accounts for 8 percent of fishermen's catches; but among shrimp fishermen in

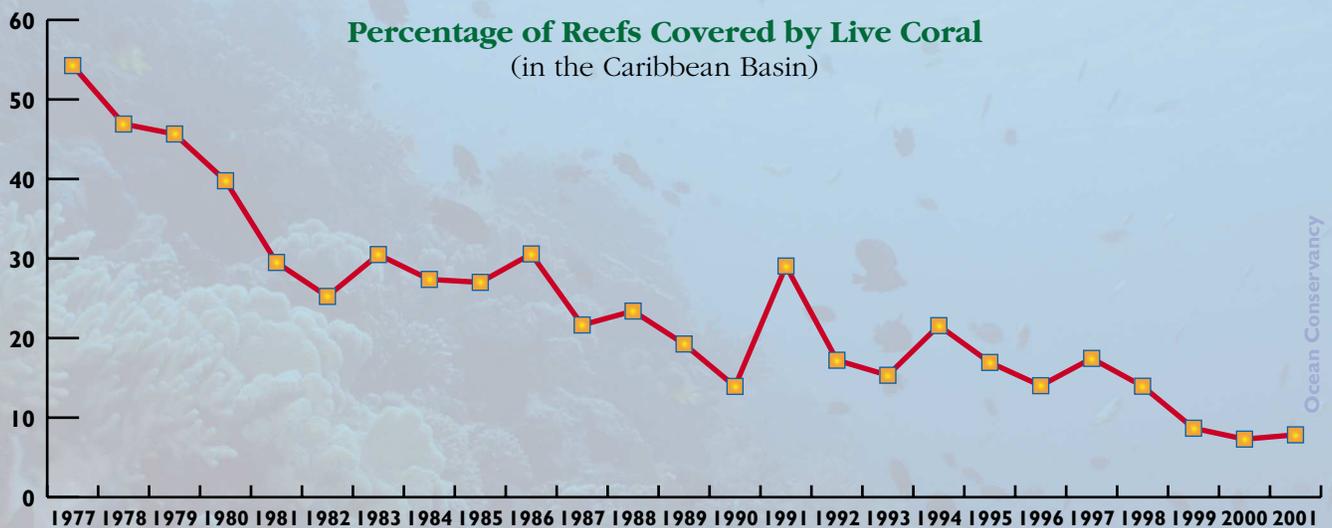
the tropics, bycatch represents 56 percent of the haul.<sup>5</sup>

Trawl nets and gear dragged along the sea bottom are said to cause lasting damage to the seafloor habitat and, thus, to the ability of marine ecosystems to sustain themselves. The heavy nets plow away the bottom plants, sponges and corals that animals use for cover, while killing large numbers of the invertebrates they feed on.

In the Gulf of Maine, for instance, the average seafloor section is trawled once a year; on the Georges Bank off Massachusetts, it's plowed three to four times a year. The trawls also create muddy clouds thought to reduce the survival of small fish by clogging their gills.<sup>6</sup> Elliott Norse, president of the Marine Conservation Biology Institute in Bellevue, Wash., calls sea bottom trawling "clear cutting the seafloor." Trawling companies contend there's no proof their activities dam-

## Caribbean Corals Are Disappearing

Only 10 percent of the coral reefs in the Caribbean are alive, compared with more than 50 percent three decades ago. Experts say corals are dying due to global warming, pollution, sedimentation and over-harvesting of fish and other reef resources — sometimes using dynamite or poison.



Source: Toby Gardner, et al., "Long-Term Region-Wide Declines in Caribbean Corals," *Science*, Aug. 15, 2003

age the ocean floor and that trawling actually may benefit seafloor species.

It's not just fish that are in crisis, however. Coral reefs, the foundation of most tropical marine life, are declining at an alarming rate. The latest international assessment found that one-fifth of the world's coral reefs "have been effectively destroyed and show no immediate prospects of recovery," while another 24 percent are "under imminent risk of collapse." Live coral cover on Caribbean reefs has declined by 80 percent over the past 30 years. <sup>7</sup> (See graph above.)

Without corals, tropical oceans would become biological wastelands, because they don't support the growth of phytoplankton, the microscopic plants that form the base of the marine food chain. Reefs are colonies of coral polyps — anemone-like organisms that build limestone shells around themselves. They filter food particles from the water and capture the sun's energy through photosynthetic micro-organisms inside their

tissue. Corals support the profusion of fish associated with tropical reefs. <sup>8</sup>

Reefs are being damaged in a variety of ways. Clearing coastal mangroves for development dooms reef creatures that feed there and triggers erosion that smothers the coral polyps under plumes of sand and soil. Overfishing results in the harvesting of increasing numbers of ever-smaller fish, lobsters and conch. Fishermen in the Philippines, Micronesia, Jamaica and Indonesia use dynamite and other explosives to stun and kill marine life over a wide area — a one-time bonanza that destroys the reef. Sewage and fertilizer run-off from towns, resorts, fish farms and golf courses trigger the growth of seaweed, kelp and other plants that can smother and eventually kill the reefs. Even far from human activity, reefs are dying from disease and overly warm water temperatures linked to climate change. <sup>9</sup>

Colder waters are affected, too. In the High Arctic, Inuit mothers' breast

milk is dangerous to their babies' health because the polar bears, seals, walrus, fish and whales they eat are contaminated by heavy metals, PCBs and other industrial compounds now found in seawater and stored in the animals' fat. Many Inuit have concentrations of certain pesticides in their bodies that exceed safe levels 20-fold. Beached whales often must be treated as hazardous waste because of the high concentrations toxic substances in their bodies. <sup>10</sup> Both wild and farm-raised salmon have also been shown to have potentially significant contaminant levels. <sup>11</sup>

Fertilizers, sewage and other nutrient pollution have triggered massive algal blooms that can strip the ocean of dissolved oxygen, dooming animals that cannot escape the area. Such oxygen-starved "dead zones" have spread from harbors and river mouths to suffocate entire seas. (See sidebar, p. 244.) Each summer, fertilizer runoff from 31 states and parts of Canada flows into

the Mississippi River and then to the Gulf of Mexico, creating a New Jersey-size dead zone south of New Orleans where few species can survive.<sup>12</sup>

Non-native, or “invasive,” species also can damage marine ecosystems.<sup>13</sup> The species are carried around the globe in the ballast tanks of ocean-going vessels, which pump water in and out of the tanks to maintain seaworthiness. This ballast can contain the eggs, larvae or adult forms of hundreds of species, some of which become established in waters that contains no natural predators.

“Once an exotic species is established, trying to remove it is like trying to put the toothpaste back in the tube,” says James T. Carlton, professor of marine sciences at Williams College in Massachusetts. In the early 1990s, a comb jelly snuffed out much of the life in the Black Sea (see p. 244), while a mutant form of a tropical seaweed, *Caulerpa taxifolia*, has smothered vast stretches of the Mediterranean shore since it was accidentally released into the sea by a Monaco aquarium.<sup>14</sup>

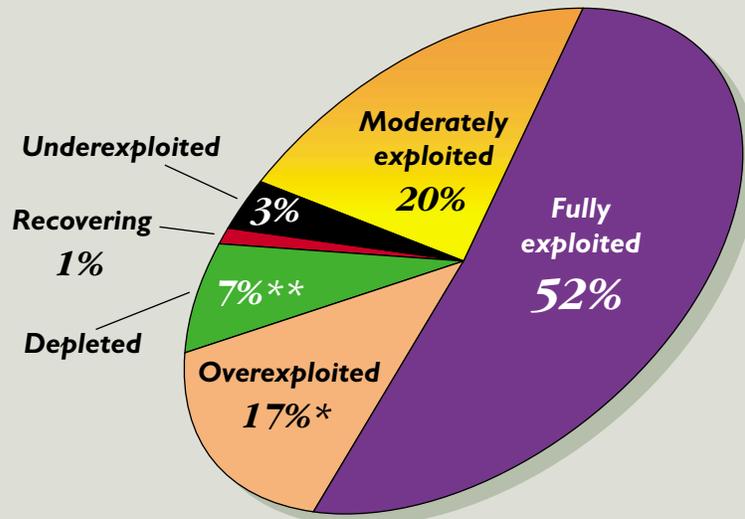
Some scientists worry that in many marine ecosystems the more advanced organisms are disappearing while the populations of the most primitive ecosystems are exploding. “Dead zones aren’t dead; they are just full of jellyfish and bacteria,” notes Jeremy B. C. Jackson, director of the Geosciences Research Division at the Scripps Institution of Oceanography in San Diego, who calls the process “the rise of slime.”

In Sweden, summer blooms of *cyanobacteria* turn the surface of the Baltic Sea into a yellow-brown slurry that kills fish, burns people’s eyes and makes breathing difficult. Hawaiian condo owners have had to use tractors to remove piles of algae piling up on their beaches, while toxic algal blooms are believed responsible for mass die-offs of sea lions, whales, manatees and dolphins. Red tides — algal blooms that make shellfish poisonous to humans — are 10 times more common than they were 50 years ago,

## Most Fish Stocks Are Overexploited

Three-quarters of the world’s fisheries were either fully exploited — at or near their maximum sustainable limits — overexploited or depleted in 2005. Fisheries biologists say the stocks cannot recover quickly and are in danger of further decline.

Status of the World’s Fish Stocks, 2005



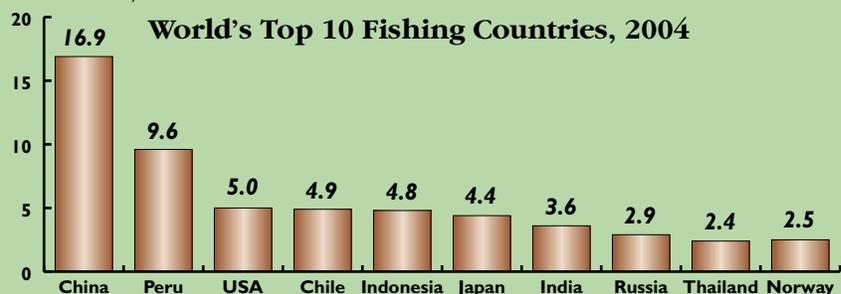
\* Exploited beyond the ability of the system to sustain itself over the long term.

\*\* Current catches fall far below historic levels.

## China and Peru Catch the Most

China and Peru haul in nearly 27 million tons of fish a year — almost as much as the next eight countries combined.

Amount of fish captured\* (in millions of tons)



\* Fish caught in the wild, excluding those grown by aquaculture.

Source: “The State of the World Fisheries and Aquaculture 2006,” U.N. Food and Agriculture Organization, [www.fao.org/docrep/009/A0699e/A0699E04.htm](http://www.fao.org/docrep/009/A0699e/A0699E04.htm)

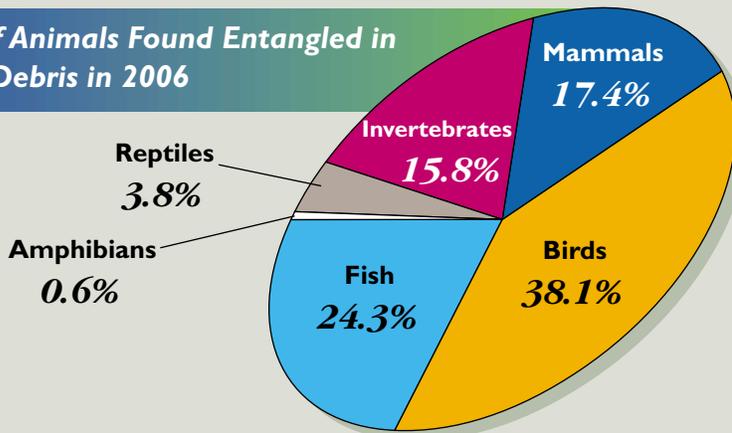
## Beach Litter Can Be Lethal

Nearly 7.7 million pieces of beach litter were collected in 2006 by some 350,000 Ocean Conservancy coastal cleanup volunteers around the world. About two-thirds of the items were food containers and plastic bags; the rest were smoking related. Experts say 1 million seabirds and 100,000 marine mammals and sea turtles die each year after ingesting or becoming entangled in ocean debris.

### Top 10 Ocean Debris Items Worldwide

Debris Items	Number of Items	Percent of Total
Cigarette debris	1,901,519	24.7%
Food wrappers, containers	768,115	10.0%
Caps/lids	704,085	9.1%
Bags	691,048	9.0%
Beverage bottles (Plastic) 2 liters or less	570,299	7.4%
Beverage bottles (Glass)	420,800	5.5%
Cups/plates/forks/knives/spoons	353,217	4.6%
Straw/stirrers	349,653	4.5%
Beverage cans	327,494	4.3%
Cigar tips	186,258	2.4%

### Types of Animals Found Entangled in Ocean Debris in 2006



Source: "International Coastal Cleanup Report 2006: A World of Difference," Ocean Conservancy

owing in part to increases in sewage and fertilizer run-off. "We're pushing the oceans back to the dawn of evolution, a half-billion years ago when the oceans were ruled by jellyfish and bacteria," says Pauly at the University of British Columbia.<sup>15</sup>

Experts argue that adopting ecosystem-based approaches to regulating human activity on the seas would help ensure the system as a whole is healthy, rather than just focusing on a particular species. Some fishing interests resist such an approach

— which would involve creation of marine reserves and other protected areas — but its greatest opponent is public and political apathy.

As scientists and governments try to determine how best to protect the world's oceans, here are some of the questions being debated:

### Are humans destroying the oceans?

Yes, according to numerous recent scientific studies including a June 2007 assessment of Europe's seas by 100 scientists from 15 countries.

"In every sea, we found serious damage related to the accelerated pace of coastal development, the way we transport our goods and the way we produce our food on land as well as the sea," said Laurence Mee, director of the Marine Institute at the University of Plymouth (in England), who coordinated the project. "Without a concerted effort to integrate protection of the sea into Europe's development plans, its biodiversity and resources will be lost."<sup>16</sup>

A four-year analysis released in November 2006 by an international group of ecologists and economists concluded that if current trends continue, every seafood species currently fished will be commercially extinct by 2050. The study found that every species lost increases the speed at which the larger ecosystem unravels.

"Whether we looked at tide pools or studies over the entire world's oceans, we saw the same picture emerging," said the study's lead author, Boris Worm, assistant professor of biology at Dalhousie University in Halifax, Nova Scotia. "I was shocked and disturbed by how consistent these trends are — beyond anything we expected."<sup>17</sup>

Likewise, two independent, bipartisan U.S. commissions — the Pew Oceans Commission and the U.S. Commission on Ocean Policy (USCOP) — concluded in 2003 and 2004, respectively, that pollution, habitat destruction and overfishing are endangering the world's oceans.<sup>18</sup>

“There is overwhelming scientific evidence that our ocean ecosystems are in serious trouble, serious enough that it really is endangering the future of ocean life itself,” says Leon Panetta, former chief of staff in the Clinton White House, who chaired the Pew Commission. “The biggest challenge is to get people to pay attention, because if they do, then we can make our case.”

“What is the state of our oceans? Unfortunately we have to report to you that the state is not good, and it is getting worse,” Admiral James D. Watkins, chair of USCOP told Congress. Furthermore, the harm humans are inflicting on the oceans, the USCOP report concluded, has “serious consequences for the entire planet.”<sup>19</sup>

Marine scientists have been aware of the situation for more than a decade. In 1998 — the U.N. International Year of the Ocean — more than 1,600 marine scientists and conservation biologists from 65 nations issued a joint warning that the seas were in peril and that immediate action was needed to prevent further damage.

“Getting scientists to agree on anything is like herding cats, so having 1,600 experts voice their concerns publicly highlights just how seriously the sea is threatened,” said Norse, of the Marine Conservation Biology Institute, who organized the effort. “We must change what we’re doing now to prevent further irreversible decline.”<sup>20</sup>

However, some researchers and fishing industry groups deny there is a problem, claiming the situation is exaggerated by environmentalists to further fundraising opportunities. “Are we running out of fish? No,” said Dan Furlong, executive director of the U.S. Mid-Atlantic Fishery Management Council. Furlong cites U.S. National Marine Fisheries Service assessments showing that of the 230 stocks the agency manages, only 44 are known to be overfished, 136 “are not subject to overfishing,” while the status of the remaining 50 are unknown. “In other



Ocean Conservancy

Plastic bottles, food containers and grocery bags make up a large portion of the refuse that ends up in the ocean and washes ashore. More than 100,000 marine mammals alone are killed each year by either ingesting or becoming entangled in debris.

words, the glass is more than half full for those stocks,” he says. The public, he says, has been duped by environmentalists who pushed Congress to require that stocks be rebuilt. As a result, he says, “despite significant improvements across a broad range of fisheries, we are cast in the role of doing poorly because we will likely fail to meet . . . the arbitrary, capricious deadline to maximize stocks all at the same time.”<sup>21</sup>

Bjorn Lomborg, associate professor of statistics at the University of Aarhus in Denmark, argues in his controversial book *The Skeptical Environmen-*

*talist* that while there are problems, the oceans are doing fine.

“The oceans are so incredibly big that our impact on them has been astoundingly insignificant,” he argues, citing U.N. data suggesting that in the open oceans, far from land, the U.N. has found the seas to be relatively clean. He acknowledges that fertilizer is creating dead zones in places like the Gulf of Mexico and the Black Sea but says the disruptions are worth it when compared to the improved crop yields.<sup>22</sup>

“Our oceans have not been defiled . . . and although the nutrient influx

has increased in many coastal waters like the Gulf of Mexico,” he continues. “This does not constitute a major problem — in fact, the benefits generally outweigh the costs.”<sup>23</sup>

Critics accuse Lomborg of cherry-picking facts that support his arguments and ignoring evidence to the contrary. For instance, Lomborg’s book fails to address the crisis in the fisheries, the decline of the coral reefs, the problems caused by alien species and other issues.

And even some fishermen don’t share Lomborg’s view. “The combination of modern electronics with large fishing ves-

sels has created a technology too powerful for fish stocks to withstand,” said Ted Ames, a fisherman from Stonington, Maine, who won a McArthur Genius Grant for his research into the decline of Gulf of Maine fish stocks.<sup>24</sup>

### *Is ecosystem-based management the solution?*

The destruction of life in the oceans presents humans with perhaps the greatest marine policy challenge in history: figuring out how to manage human activities so they don’t damage marine biodiversity, critical habitat and overall ecosystem function. Known as “ecosys-

tem-based management,” the approach has wide support, including both USCOP and the Pew Commission.

“You’re not going to have any fish to catch — or healthy fishing communities — unless there is a healthy marine ecosystem to provide the fish,” says Jane Lubchenco, a professor of marine biology at Oregon State University, a former Pew Commissioner and past president of the American Association for the Advancement of Science. “We need mechanisms to better understand how ocean ecosystems work and how we’re changing them if we are going to do a better job managing them.”

## The Black Sea’s Cautionary Tale

*Ecosystem collapse shows signs of recovery.*

From ancient times, humans have been drawn to the Black Sea, a kidney-shaped basin the size of California nestled between Eastern Europe and Asia Minor. Its anchovy and sturgeon stocks sustained Ancient Greece, medieval Byzantium, the Ottoman Empire and Imperial Russia.

In the 20th century, millions of tourists flocked each summer to its beaches in Turkey and on the “Communist Riviera,” which stretched from Bulgaria and Romania to Soviet Russia. They swam, feasted on fish and basked in the sunshine, recuperating from winter months in the factories of Budapest and Birmingham.<sup>1</sup>

Then, with astonishing suddenness, the ecosystem collapsed in the early 1990s due to a combination of fertilizer and sewage pollution runoff, destruction of wetlands and the introduction of an aggressive, non-native, jellyfish-like species. Given the plethora of critical ocean ecosystems now in jeopardy, the Black Sea collapse provides a cautionary tale about the fragility of marine ecosystems, say marine scientists.

“The Black Sea is a microcosm of the environmental problems of the planet,” warns Janet Lubchenco, a professor of marine biology at Oregon State University. “Solutions to the Black Sea crisis may enlighten, inform and inspire our global challenges.”<sup>2</sup>

Few saw it coming. The Black Sea had been subject to pollution for decades: Industrial wastes, oil spills and radiation from the 1986 Chernobyl nuclear accident had been carried to the sea by its tributaries — apparently without dramatic effect. But it was the buildup of raw sewage and fertilizer runoff — coupled with the accidental introduction of an alien, plankton-devouring species, the comb jelly — that triggered the near-death of the sea.

The sea’s largest tributary, the Danube River, drains half the European continent during its 2,000-mile journey from the

Black Forest of Switzerland to Romania’s Black Sea delta. The last half of that journey winds through Eastern Europe, where for decades every village, town and city flushed its untreated sewage into the river. Starting in the late 1960s, state-owned farms used huge quantities of subsidized chemical fertilizers on their fields, and much of it ran off into the streams feeding the Danube. Hydroelectric projects and navigational canals also damaged or bypassed wetlands that once acted as the river’s natural filtering system. And Romania’s dictator, Nicolae Ceausescu, waged all-out war on the Danube delta — Europe’s greatest wetland — in an ill-conceived attempt to convert it to rice production.<sup>3</sup>

As a result, concentrations of nitrogen and phosphorous nutrients in the Black Sea’s ecologically critical northwestern shelf dramatically increased between 1960 and 1980.<sup>4</sup> The nutrients fueled enormous algae blooms in the late 1980s, smothering bottom life by using up the oxygen it needed. As the microscopic plants decomposed, they consumed still more oxygen in vast stretches of the sea, suffocating most other creatures.<sup>5</sup>

Then in 1982, *Mnemiopsis leidyi*, an inch-long comb jelly native to North America, was introduced to the sea in the ballast water of a passing ship. The creature established itself amid the gathering chaos and proceeded to graze the waters clean of survivors. With no natural predators, it ultimately achieved a biomass of 1 billion tons — 10 times the weight of all the fish caught by all the world’s fishermen in a year.<sup>6</sup>

“The biomass of other zooplankton dropped sharply, and the catches of commercial fish sharply decreased,” noted Yuvanal P. Zaitsev chief scientist at the Odessa office of the Ukrainian National Academy of Science. “*Mnemiopsis* . . . is usually held responsible for much of what happened.”<sup>7</sup>

By the early 1990s, total fish landings had fallen to one-seventh of their previous level, and the signature anchovy catch fell by 95 percent. Slicks of ugly, stinking slime drove tourists from the beaches and prompted long closures at the height of summer. Hundreds of bathers became ill and several died from cholera and other infectious diseases that thrived in the algae-choked environment. In 1999 the World Bank estimated the economic damage to the fisheries sector at \$300 million a year and \$400 million to tourism.<sup>8</sup>

The past five years have seen considerable progress, however, as the European Union — with its strict environmental regulations — expanded to include 10 former communist countries, including Slovakia, Hungary, Romania, Bulgaria and other nations in the Danube's middle and lower basin.<sup>9</sup>

"When these countries joined the EU, they had to adopt new environmental policies and regulations, which has had the benefit of improving the overall water quality situation in the Danube basin," notes Ivan Zavadsky, program director of the Danube/Black Sea Regional Program in Vienna, a joint project of the United Nations and World Bank, which has pumped \$70 million into cleanup projects in the region.

New sewage treatment plants have been built in recent years, and many of the most polluting factories and agricultural enterprises collapsed in the early 1990s. As a result, Zavadsky notes, concentrations of phosphorus and nitrogen — the nutrients that ravaged the Black Sea — have dropped 50 percent and 20 percent, respectively, since 1989. Meanwhile, the *Mnemiopsis* population dropped precipitously after the arrival of the Beroe, another invading comb jelly that feeds exclusively on *Mnemiopsis*. Once the Beroe had eaten all the *Mnemiopsis*, its food source was depleted, so Black Sea populations of both species have now been decimated.<sup>10</sup>

"We're witnessing the first signs of a recovery of the Black Sea ecosystem," says Zavadsky, citing reduced algae blooms and an increase in some bottom plants and animals. "But the situation remains on a knife's edge."

But Janos Zlinszky, the government and public affairs manager of the Regional Environmental Center for Central and Eastern Europe in Szentendre, Hungary, is concerned that many of the gains could be lost if the region's economic recovery outpaces its environmental investments. "Romania and Bulgaria have just joined the EU," he says. "If they decide to focus on intensive agriculture rather than the organic market, we could see great increases in fertilizer and pesticide use."

"There's an extraordinary window of opportunity to take action," says Laurence Mee, director of the Marine Institute at the School of Earth, Ocean and Environmental Sciences at the University of Plymouth, in England. "But it can easily be lost."

<sup>1</sup> Colin Woodard, *Ocean's End: Travels Through Endangered Seas* (2000), pp. 1-25.

<sup>2</sup> From a speech in Trabzon, Turkey, Sept. 20, 1997.

<sup>3</sup> Woodard, *op. cit.*, pp. 13-23.

<sup>4</sup> Amhet Kideys, "Fall and Rise of the Black Sea Ecosystem," *Science*, Aug. 30, 2002, p. 1482.

<sup>5</sup> "Pollution and Problems of the Black Sea," a speech by Radu Mihnea, Romanian Research Institute, in Batumi, Georgia, Sept. 21, 1997.

<sup>6</sup> Kideys, *op. cit.*, p. 1482; Woodard, *op. cit.*, p. 22.

<sup>7</sup> "The Black Sea: Status and Challenges," a speech by Yuvenaly Zaitsev in Novorossiysk, Russia, Sept. 23, 1997.

<sup>8</sup> "Black Sea Transboundary Diagnostic Analysis," Global Environment Facility, August 1997, pp. ii, 15, 123, 125; Woodard, *op. cit.*, p. 22; Emilia Battaglini, "The GEF Strategic Partnership for the Danube/Black Sea," Presentation to World Bank, Bucharest, February 2007.

<sup>9</sup> For background, see Brian Beary, "The New Europe," *CQ Global Researcher*, August 2007.

<sup>10</sup> Kideys, *op. cit.*

And many scientists say they don't yet have that understanding.

For the past two years, dozens of scientists in New England and Canada's maritime provinces have been working to develop enough knowledge to undertake ecosystem-based management in the Gulf of Maine by 2010. Scientists working on the Gulf of Maine Census of Marine Life — part of the world's first pilot project for this type of management — are fanning out across the ecosystem examining sea life, ocean currents and the relationship between habitat, predators and prey. A series of ocean buoys

is collecting long-term oceanographic data, and other researchers are using sonar technology to map the ocean bottom in unprecedented detail.

"We need to know the big picture of how it happens," says Gerhard Pohle, acting executive director of the Huntsman Marine Science Centre in St. Andrews, New Brunswick, Canada. "If we take one rivet out of the airplane, will it crash? If so, which rivet?"<sup>25</sup>

"We're just beginning to understand how to do the biology on both the super-tiny and the super-large scales," says Lubchenco, who is studying the California Current ecosystem off the

U.S. West Coast. "You have to marry oceanography and ecology and genetics and microchemistry in a very interdisciplinary fashion to better understand the processes driving these ecosystems."

But other scientists — many of them government fisheries managers — say sufficient knowledge already exists to start ecosystem-wide management. "Make no mistake, we currently have sufficient scientific information to move forward with an ecosystem-based approach to management," said Andrew Rosenberg, dean of the College of Life Sciences at the University of New Hampshire, a

USCOP commissioner and former deputy director of the U.S. National Marine Fisheries Service. “The nation’s ocean policy should recognize these principles and seek to integrate management within regional ecosystems.”<sup>26</sup>

Some scientists and environmentalists challenge the notion that humans can or should try to manage ecosystems. In the long term, they say, how could one manage a constantly changing ecosystem, when ideas about what is “healthy” or “desirable” are often based on present conditions or a theoretical, idyllic state. Others point out that an ecosystem means different things to different people, making them difficult to adequately define.<sup>27</sup>

Proponents are careful to point out that ecosystem-based management does not seek to manage the ecosystem — which would be scientific hubris in their opinion — but rather human activity affecting the ecosystem. “One of the reasons ecosystem-based management was poo-hooed for many years was that there was this naïve assumption [that] you just learn everything you need to know about the ecosystem and then you manage it,” says Lew Incze, director of the Aquatic Systems Group at the University of Southern Maine in Portland. “Now we know that we will never know everything — you can even have 100 years of good data, but the ocean is always changing.

“The question is,” he continues, “what type of knowledge would allow you to pursue the idea?”

The Gulf of Maine Census of Marine Life is attempting to develop a basic framework by testing ideas about what factors control the number of upper-level predators like Atlantic cod or humpback whales; what indicators would best track the health and diversity of the entire system and how currents, tides and natural oceanographic cycles shape life there. “We’re just now developing the tools to come to grips with this,” says Pohle.

David Benton, executive director of the Marine Conservation Alliance, a

coalition of Alaskan fishing interests, says ecosystem-based management is potentially very good for commercial fishermen.

“It’s very clear to most of our membership that it is in their long-term interest to make sure that we have healthy oceans and fish stocks and that all the associated components of the ecosystem around those stocks are in good shape,” he says. “A lot of these companies are looking at how these fisheries are going to support their business — not two years from now but a decade from now or longer.”

### ***Should ocean-floor trawling be restricted?***

Concerns about the damage caused by shellfish dredges and trawl nets have prompted many scientists, environmentalists and governmental agencies to call for a ban on trawling where it is likely to cause lasting harm.

A 2002 study by the National Academy of Sciences’ National Research Council recommended that the U.S. government reduce the impact and extent of bottom trawling to reduce its impact on undersea life. Trawls scrape away cold-water corals, sponges, plants, sea anemones, starfish and other creatures, the report found, and repeated passes can cause a 93 percent reduction in these and other bottom-dwelling animals.

“The more we understand about the ecology of fishes, the more we find that for the animals that live right above the seafloor, the integrity of these seafloors is critical to their survival,” said Peter Auster, science director of the National Undersea Research Center at the University of Connecticut and a co-author of the report.<sup>28</sup>

Mark Butler, policy director at the Ecology Action Center in Halifax, Nova Scotia, argues there are other fishing methods that don’t damage bottom habitats. “We are talking about protecting the ocean floor, which is often the nursery for young fish. You damage that in a major way, then you

perhaps start to impair the health of the fishery itself.”<sup>29</sup>

Of particular concern are the effects of trawling on seamounts — underwater mountain havens for life in the deep ocean. A 2006 U.N. study found that many seamount fisheries had been quickly depleted and estimated that some 95 percent of the ecological damage found on the undersea mountains was due to bottom-trawling. The study prompted New Zealand, the United States and other countries to push for a worldwide ban on bottom trawling on the high seas — international waters located more than 200 nautical miles from dry land. The measure was defeated when Canada, Iceland, Russia and China refused to back it.<sup>30</sup>

The Madrid-based environmental organization Oceana advocates limiting bottom trawlers and dredgers to areas where they already fish, excluding them from areas containing deep sea coral and sponge habitat, two species that recover poorly from trawling disruptions. Although the U.S. Commission on Ocean Policy didn’t address the trawling issue specifically, the Pew Commission said it should be excluded wherever it will reduce biodiversity or alter or destroy “a significant amount of habitat.” “Sensitive habitats as well as areas not currently trawled or dredged should be closed to such use immediately,” the report said.<sup>31</sup>

Federal fisheries managers in the United States banned bottom trawling from 300,000 square miles of such habitat off the U.S. West Coast. New Zealand, generally regarded as a leader in oceans policy, banned bottom trawling in 2006 in 30 percent of its waters.<sup>32</sup> Rosenberg of the University of New Hampshire contends trawling doesn’t need to be universally banned. “You have to manage where trawling occurs and what level of impact we can sustain without reducing the resource productivity.”<sup>33</sup>

Meanwhile, the European Union has been criticized for the “cash for access”

deals it made with 12 West African states. Under the agreements — which include few, if any, conservation provisions — hundreds of European trawlers are operating in a “fundamentally unsustainable” manner, according to Milan Ilnyckyj, a doctoral student at Oxford University who has studied the problem.<sup>34</sup>

Si'd Ahmed Ould Abeid, president of Mauritania's National Fisheries Federation, said the fisheries agreements with the EU have been “a catastrophe for the fishermen whose catches are down and for the future of the fish in our waters. . . . The fish are just taken from our water, our fishermen lose their lives and we don't gain anything.”<sup>35</sup>

Justin Brashares, an assistant professor of environmental science policy at the University of California-Berkeley, argues that the quickest way to increase the production and sustainability of West African domestic fisheries would be to limit the access of the foreign trawlers.

But EU Fisheries Commissioner Joe Borg argues deals such as the one the EU struck with Mauritania would benefit both parties in terms of “jobs, strengthened monitoring and control, conservation of resources in compliance with scientific assessment and environmental protection.”<sup>36</sup>

Paul Molyneaux, author of *The Doryman's Reflection*, about his career as a commercial fisherman in Alaska, New Jersey and Maine, says the damage wrought by industrial-scale fishing is so great that it will be years before trawling will be ecologically appropriate in many areas. “In the short term, I think it should be banned,” he says. “In many places they have destroyed the ecosystem foundations by dragging, taking too many fish, and disrupting the stock structure. They put everybody else out of business, and then they went out of business themselves.”

But trawler owners argue that, far from damaging the environment,



Marine Conservation Biology Institute/Elliott A. Norse

*More than 7 million metric tons of unwanted sea life — bycatch — is caught in the huge nets of commercial fishermen and discarded, including seabirds, stingrays, juvenile fish, sea turtles, dolphins, sharks, crabs, starfish, anemones, sponges and other creatures.*

*Bycatch often dies before it gets thrown back into the sea. In the tropics, bycatch represents 56 percent of the haul.*

their gear actually improves marine productivity by plowing the seafloor and churning up nutrients. “A lot of fishermen feel that they are freshening the bottom, sort of turning over the soil, tending a garden, and that this helps certain species,” says Bonnie Brady, executive director of the Long Island Commercial Fishermen's Association.

James Kendall, executive director of the New Bedford (Mass.) Seafood Coalition, argues nobody knows whether scallop dredges harm or hurt the fishery. “Does this activity oxygenate the sediment, release buried nutrients, damage herring-egg beds or adversely affect juvenile fish and scallops?” he asks, adding that more study is needed to answer those questions.<sup>37</sup>



Greenpeace/©Robert Visser

The Seattle-based factory trawler *Northern Eagle* can harvest 50-60 metric tons of pollock per day in the Bering Sea. The decimation of global fisheries is blamed largely on powerful new technologies — including radar, fish finders and satellite tracking and navigation systems — as well as onboard processing plants, flash freezers and nets that stretch for miles.

“I am not suggesting that the act of scalloping on the ocean floor does not create an impact upon it, but that it may not be the adverse one so easily assumed,” he continues, noting that the best scallop grounds have remained constant for decades, despite intensive dragging.

Some studies from the intensively trawled North Sea support the fishermen’s contentions, at least in part. Scientists have observed 35 times as many fish gathered in areas that had recently been trawled compared to adjacent unfished areas, suggesting the fish were attracted to the disturbed bottom to feed. Bottom trawling appears at least partially responsible for increased growth rates in sole and plaice, two North Sea flat fish, presumably because the disturbances promote the growth of small invertebrates they like to eat. A third study suggested that two other North Sea species — gurnards and whiting — were drawn to trawl tracks to feed on tube worms dredged up by the fishing gear.<sup>38</sup>

Furlong, of the Mid-Atlantic Fishery Management Council, contends dragging and dredging can be appropri-

ate in sandy, muddy bottoms like those off New Jersey, Delaware and Maryland. “There’s nothing to clear cut down there,” he said. “You can’t clear cut sand.” A 1989 bottom trawling assessment of a sandy area by the Massachusetts Division of Marine Fisheries found no damage to bottom-dwelling lobsters and negligible habitat impacts.<sup>39</sup> ■

## BACKGROUND

### Run on the Banks

Fishing has been an important activity since prehistoric times. Fishermen using hand nets, hand lines and open boats may have found the seas teeming, but even then — archaeologists have found — early people depleted seafood resources. Ancient garbage heaps show the size of fish and shellfish often became smaller over time.<sup>40</sup>

The advent of industrialized fishing in the 19th century greatly increased human impact on marine ecosystems. Instead of using baited hooks or traps, fishermen developed gear that could pursue and scoop up fish. In the early 1800s, the development of steam-powered ships allowed fishermen to drag larger net bags across the seafloor. At first it was a clumsy proposition: The bag was held open with wooden beams that often hung up on rocks and other obstructions. In the 1890s, however, British fishermen replaced the beam with a pair of small boards, rigged in such a way that when pulled through water they flew apart like kites, holding the mouth of the net open; a heavy chain kept the net bottom dragging on the seafloor to prevent fish from escaping underneath. The so-called otter trawl was incredibly effective and quickly dominated the North Sea fleet. Starting in 1905, it was deployed in North America.<sup>41</sup>

The destructive potential of trawling was clear as early as 1912, when Congress demanded an investigation of fishermen’s claims that it “is such an unduly destructive method that if generally adopted . . . the fishing grounds [will be] quickly rendered unproductive.” Investigators recommended that trawls be restricted to a few areas in New England, but their advice was not acted upon.

In the 20th century the scale and power of fishing technology increased enormously. Diesel engines, introduced in the 1920s, were cheaper, safer and more reliable than steam; otter trawls were adapted to trap shrimp, clams, oysters and scallops. Processors invented a way to mass-produce fish filets — which could be sold fresh, canned or smoked at processing plants — and commercial-scale flash freezing, which eventually led to fish “sticks.” In the late 1920s, processors like General Foods began building their own trawler fleets, completing the industrialization of the industry.

*Continued on p. 250*

# Chronology

---

## **1800s-Early 1900s**

***Fish stocks decline as fishing becomes more mechanized and new trawling methods are developed.***

### **1905**

The steam-powered otter trawl is deployed in North America, making industrial fishing possible in previously unfished areas.

---

## **1920s-1940s**

***Diesel engines replace steam, triggering an expansion of offshore trawling. U.S. processors develop flash freezing. Norwegian fishermen begin dragging for shrimp.***

### **1936**

New England halibut catch falls to 2 million pounds from 13.5 million in 1902; haddock falls by two-thirds.

### **1946**

International Convention for the Regulation of Whaling is adopted.

---

## **1950s** ***The first factory trawlers come into use, mainly in North Atlantic. Pollution runoff from land-based development begins disrupting global ecosystems.***

### **1954**

A Scottish firm builds the first freezer-equipped “factory” trawler, the *Fairtry*, which is four times the size of conventional trawlers.

### **1959**

Antarctica Treaty is adopted, sparing the southern continent and surrounding oceans from hunting, industrial activity and fishing pressure.

## **1970s-1980s**

***Countries extend their territorial seas to prevent foreign overexploitation. Pollution disrupts ocean life. Fisheries decline sharply. Iceland fights “cod war” to extend its territorial waters.***

### **1972**

Congress passes Coastal Zone Management, Clean Water and Marine Mammal Protection acts.

### **1975**

U.N. adopts Convention on International Trade in Endangered Species, which helps reduce cross-border trade in marine animal products.

### **1977**

U.S., Canada, others adopt 200-mile territorial limits. Trawlers move to Africa, Asia and the Caribbean.

### **1982**

U.N. Convention on the Law of the Sea becomes the first international agreement to regulate ocean use. International Whaling Commission bans most commercial whaling beginning in 1986.

### **1989**

Norway restricts cod fishing to protect declining stocks; cod recovers by 1992.

---

## **1990s-2000s**

***Black Sea ecosystem collapses. Coral reefs decline worldwide and climate change, pollution and chronic overfishing appear to be driving oceans into crisis.***

### **1990**

Pollution, overfishing and the introduction of a non-native comb jelly species devastate the Black Sea.

### **1991**

British North Sea cod stocks have declined by more than two-thirds in 10 years.

### **1992**

Canada closes Grand Banks cod fishery; stock stands at 1 percent of 1965 levels.

### **1994**

U.S. closes key New England fisheries; slow recovery begins.

### **1998**

Bleaching destroys 16 percent of the world’s coral reefs. Cause is unknown.

### **2002**

European Union (EU) recommends member states adopt integrated coastal zone management.

### **2003**

Pew Oceans Commission urges immediate action to protect the oceans; Canadian study says stocks of large predatory fish have fallen by 90 percent worldwide since 1950.

### **2004**

U.S. Commission on Ocean Policy calls for ecosystem-based response to protecting oceans and coasts.

### **2006**

Iceland breaks whaling ban. . . . Most EU members have adopted integrated coastal zone management plans. . . . Pro-whaling bloc gets whaling ban declared no longer necessary.

### **2007**

Hundreds of marine species — including corals for the first time — are added to the World Conservation Union’s “red list” of species facing the risk of extinction.

*Continued from p. 248*

But fish stocks could not stand up to the technology. In New England, the halibut catch fell from 13.5 million pounds in 1902 to 2 million in 1936; the haddock catch fell by two-thirds between 1929 and 1936, while winter flounder became so scarce fishermen began targeting the previously spurned yellowtail flounder. By World War II, the yellowtail had been depleted, and near-shore stocks of cod and haddock were driven into commercial extinction.<sup>42</sup>

In 1954, a Scottish whaling firm built the first factory trawler, modeled on the big processing ships that had wiped out Antarctica's whale stocks. *The Fairtry* weighed 2,600 tons, more than four times the size of the conventional trawlers of the day, and was equipped with an onboard processing and freezing plant and nets large enough to swallow the Statue of Liberty. It could operate 24 hours a day for weeks on end, allowing the ships to travel to fisheries thousands of miles from home. The design

revolutionized distant-water fishing.

By the 1970s, the Soviet Union was operating more than 700 freezer trawlers, and the two Germanys, Poland, Spain, France and Japan each had dozens more.<sup>43</sup> So-called mid-water trawls were developed to target mackerel, herring and anchovies that lived in medium depths. The ships massed on fishing grounds off Newfoundland, New England, Antarctica and the Bering Sea and mined one fish stock after another into near-oblivion.

## Whaling Nations Want Hunting Ban Lifted

*Japan, Iceland and Norway are leading the charge.*

Great whales are up against a lot these days: Their food supply has diminished and is laced with PCBs and heavy metals, noise from sonar devices plagues their habitat and entangling fishing nets and passing ships are a constant threat. It's no surprise that most varieties — including blue, fin, humpback, sperm and right — remain on the endangered species list.

But in October 2006 Iceland announced it would resume hunting great whales, breaking the International Whaling Commission's (IWC) 21-year-old global moratorium on commercial whaling.\*

Iceland's commercial whalers were permitted to kill nine endangered fin whales — the second-largest species after blue whales — and 30 smaller, more abundant minke during the year ending Aug. 31, 2007, ostensibly for scientific research. By last November, however, they had already killed seven of the endangered fins, setting off a storm of international criticism.<sup>1</sup>

"It's outside all international norms to hunt an endangered species," says Susan Lieberman, director of the World Wildlife Fund's Global Species Program in Rome. "There is a commercial whaling moratorium in effect, so we're not saying it's fine and dandy to be hunting [the non-endangered] minke. But targeting fin whales is a far more confrontational and aggressive act."

Whale meat is a delicacy in Iceland, Norway and Japan, particularly with older generations, and whaling nations say hunting and consuming whales is part of their cultural heritage. But critics point out that all three countries have difficulty disposing of whale blubber and other non-meat byproducts, leading conservationists to question why they continue the hunt.

Last November 25 countries — including the United States, Great Britain and Australia — demanded a halt to Iceland's hunt. Critics say it undermines the IWC by directly challenging its moratorium.<sup>2</sup>

"They are testing what the international reaction would be, and I think they've found it has been pretty harsh," says Sue Fisher, trade expert at Britain's Whale and Dolphin Conservation

Society. "What they're doing is a violation of the ban."

In fact, the moratorium has been unraveling for years, largely because of Japan's diplomatic maneuvering. It used aid and trade measures to convince a small army of previously disinterested Caribbean and Pacific nations to join the IWC and vote with Japan. As a result, in 2006, the pro-whaling bloc achieved a simple majority and passed a symbolic measure declaring the ban no longer necessary. But the measure fell short of the three-quarters majority needed.

In retaliation, the United Kingdom and other anti-whaling nations have recently recruited five disinterested proxies of their own — Croatia, Cyprus, Ecuador, Greece and Slovenia — to help stave off the pro-whaling bloc.<sup>3</sup>

Norway, which is allowed to legally hunt whales commercially, focused exclusively on minke, which are about an eighth the mass of fin whales. Operating from small vessels, Norwegian fishermen kill between 600 and 800 minke each year out of an estimated North Atlantic population of over 170,000.

Norway's leading environmental groups support the hunt, arguing it is a sustainable fishery that produces organic meat with fewer inputs than a corporate beef or pork farm. "We use small fishing vessels that consume few inputs and cause almost no pollution — it's very friendly eco-production," says Marius Holm, co-chairman of the Bellona Foundation environmental

\* The 1986 moratorium allowed nations to legally continue whale hunting if they filed official reservations prior to the adoption of the ban. Norway made such a reservation. Iceland and Japan did not, though Iceland tried to claim one after the fact, when it first resumed hunting minke for "scientific purposes" in 2003. Japan conducts a "scientific" research hunt — also allowed under IWC rules — taking about 900 minke in the Southern Ocean. Non-whaling nations consider the hunt a violation of the spirit of the treaty. Aboriginal hunters are exempt and permitted to hunt a limited number of whales for cultural and religious purposes.

organization in Oslo. "Our principle is that we should harvest what nature provides, but in a sustainable way regarding the ecosystem as a whole and the specific stocks."

"The hunt we have had along our coast has always been sustainable," says Halvard Johansen, deputy director general of the Norwegian Ministry of Fisheries and Coastal Affairs. "We've been whaling on this coast since the 9th century, and we don't see that big a difference between aboriginal whaling in Alaska, Russia and Greenland and what we do here."

Stefan Asmundsson, Iceland's whaling commissioner, claims his country's hunts are also sustainable, despite targeting an endangered species. "The fin whale stocks being targeted by Iceland are not in any way endangered," he says. "There is no lineage between the stocks in the North Atlantic, which are abundant, and those in the Southern Hemisphere" that were decimated by factory whaling fleets in mid-20th century.

Indeed, many in the West fear a return to those dark days when Norway, Japan and other whaling nations drove many great whales to the brink of extinction to procure industrial oil and pet food. Recovery has been slow. In 2003, a study by Stanford University geneticist Stephen Palumbi suggested that the pre-whaling populations of North Atlantic humpback, fin and minke whales were far larger than previously thought and won't return to exploitable levels for many decades.<sup>4</sup>

Others say Japan and Iceland are defending whaling out of a sense of national pride rather than economic necessity, since their domestic markets have been unable to absorb the meat from their scientific minke hunts. As whale meat piles up in freezers — 4,400 tons according to Greenpeace — Japan has resorted to introducing it in school lunch programs.

"Almost all those who like whale meat are middle-aged and older," admits Kouji Shingru, owner of the only whale-meat retail shop in Tokyo. "Young people have no experience with eating whale. In fact, my shop is one of the only places where young people have a chance to eat it."<sup>5</sup>



Getty Images/Koichi Kamoshida

Japanese whalers butcher a Baird's beaked whale, a species not in danger of extinction. Despite a 1986 ban on commercial whaling, the International Whaling Commission allows Japan and Norway to hunt whales, and Iceland announced in October 2006 it would resume hunting great whales.

"This is not driven by economics, it's just political, which makes it far more egregious," says Lieberman.

<sup>1</sup> Krista Mahr, "Defying global ban, Iceland to resume commercial whaling after almost 2 decades," *The Associated Press*, Oct. 17, 2006; Colin Woodard, "Thar She Blows," *E Magazine*, January 2007.

<sup>2</sup> Lewis Smith, "Iceland's whaling sinks tourism: Two dozen nations protest hunting," *Calgary Herald*, Nov. 2, 2006.

<sup>3</sup> Micheal McCarthy, "Pro-hunting Japanese seize control of whaling commission," *The Independent* (London), April 17, 2006, p. 2; Richard Lloyd Perry, "Japan may go it alone after defeat over whaling ban," *The Times* (London), June 2, 2007.

<sup>4</sup> Stephen Palumbi and Joe Roman, "Whales before whaling in the North Atlantic," *Science*, July 25, 2003, p. 508.

<sup>5</sup> Greenpeace International press release, Jan. 30, 2007; Leo Lewis, "Giant of the sea used as petfood," *The Times* (London), Feb. 10, 2006.

In 1977, following Iceland's lead, Canada, the United States and other nations extended their territorial waters from 12 to 200 nautical miles in order to push foreign factory trawlers off their banks and save the fish for themselves. Fish stocks had been damaged, but with proper regulation it was assumed they would recover.

## Stocks Crash

After kicking foreign fleets out, the United States, Canada and other na-

tions built their own modern trawler fleets. Though the vessels were much smaller, they carried the latest fish-finding gadgetry and were capable of fishing the offshore banks. Encouraged by government incentives, New England trawlers larger than 125 tons grew by 144 percent between 1976 and 1979, while the number of medium-size trawlers nearly doubled. Other governments offered similar incentives, increasing the size of the world's fishing fleet by 322 percent from 1979 to 1989.<sup>44</sup>

In New England and Canada, the domestic fleets quickly wiped out many

stocks, including the cod stocks that had attracted Europeans to colonize the region in the first place. Between 1965 and 1999, New England's haddock catch fell by 95 percent, halibut by 92 percent and cod by 40 percent, prompting managers to close many fishing grounds. On Newfoundland's Grand Banks, the greatest cod fishery in the world was reduced by 98.9 percent in the 30 years leading up to its 1992 closure.

The pain of the closures and other fishing restrictions eroded the economic and cultural foundations of many New England and Canadian communi-



Great Barrier Reef Marine Park Authority/Paul Marshall

A diver in the Great Barrier Reef Marine Park in Australia photographs masses of bleached staghorn coral, which occurs when sea temperatures rise and kill microbes that give coral its bright colors. Rising sea temperatures and other mostly man-made factors are said to be killing coral reefs at an alarming rate.

ties, and fueled an exodus of young people from Newfoundland. “We are witnessing an entire generation without hope, enthusiasm and access to meaningful, steady employment,” noted Michael Temelini, assistant professor of political science at the Memorial University of Newfoundland. “[Our] 500-year-old civilization is disappearing.”<sup>45</sup>

Fifteen years after the closure, Newfoundland’s cod appear unable to regain their place in the ecosystem, while depleted fish stocks on Georges Bank and in the Gulf of Maine are recovering slowly. Fish plants have closed throughout eastern North America, and large fishing vessels have vanished from harbors whose residents had fished offshore for centuries.<sup>46</sup>

Similar devastation has occurred from the North Sea to the Gulf of Thailand. “Ten years ago, we could catch anything we wanted,” said Sophon Loseresakun, a fisherman in Talumphuk, Thailand. “Now we have almost nothing.”<sup>47</sup>

Eventually, the large fishing vessels moved on to the developing world, buying access to fishing grounds that once supported small-scale local fishermen. “European and Russian distant-water fishing fleets shrank and their remnants turned south,” recalled Carl Safina, president of the Blue Ocean Institute, a marine conservation advocacy group in East Norwich, N.Y., “under-paying their way into the fishing zones of countries too desperate for foreign cash to say no, lest the same bad offer be accepted by a neighboring country and the boats go there instead.”<sup>48</sup>

Today, subsistence fishermen in canoes in Mauritania and other African nations compete with hundreds of government-subsidized Spanish, Russian and Chinese trawlers. West African fish stocks have declined by 50 percent over the past 30 years, and thousands of fishermen have been put out of work.<sup>49</sup> Likewise, South Pacific nations have sold tuna fishing rights to

Russian, Chinese and Taiwanese companies, even though the valuable fish is one of their few natural resources.

Other vessels have turned to the high seas, beyond the reach of government, to fish for orange roughy, Patagonian toothfish and other long-lived, slow-to-reproduce species. According to a University of British Columbia study, high-seas bottom trawlers receive \$152 million a year in subsidies worldwide.

“Eliminating government subsidies would render the fleet economically unviable,” said lead author Rashid Sumaila.<sup>50</sup>

“We are vacuuming the ocean of its content,” said French environmentalist Jean-Michel Cousteau, son of the late ocean explorer Jacques Cousteau. “If this continues, there will be nothing left.”<sup>51</sup>

## Shifting Baselines

Scientists now realize that the damage to the oceans is far worse than previously estimated. New forensic research using fishing logbooks, archaeological evidence and genetic tests reveals that ocean life was far more abundant in the pre-industrial era than anyone had assumed.

For instance, after witnessing the destruction of many of Jamaica’s coral reefs, Jackson of the Scripps Institution used historical records to determine how the Caribbean might have looked in 1492. “Think about the wildebeests and lions and all that on the plains of Africa,” he says. “Well, there was a world in which the biomass of big animals among the reefs was greater than the biomass of the big mammals of the Serengeti plains.”<sup>52</sup>

Based on hunting records, adult green sea turtles — now rare — once numbered at least 35 million and may have exceeded 550 million. “Think about that: 35 million 220-pound turtles grazing on crustaceans, sea grass, starfish and mollusks,” he says. “The productivity of those

reefs must have been fantastic. The whole mind-set of scientists about what is a 'pristine' reef is completely wrong." His research suggests that by wiping out sea turtles — used for food in the 19th century — humans probably triggered the collapse of sea grass beds, which suffer infections when they are not grazed.<sup>53</sup>

Similarly, W. Jeffrey Bolster, a professor of maritime history at the University of New Hampshire, and colleagues used 19th-century logbooks to reconstruct the scale of the cod catch and the average size of the fish. The results stunned fisheries experts. In 1861 alone, small-boat fishermen from several Maine towns — using small sailboats and baited hooks — caught more fish than all the U.S. and Canadian fishing fleets combined caught in the Gulf of Maine between 1996 and 1999. Today, there are virtually no cod in the area.

"Ask yourself, 'What were all those cod eating?'" Bolster says. "When you think about the copepods and krill, all the way up to the alewives and mackerel that had to be present in the inshore area to feed them, it's flabbergasting.

"The world we have today," he points out, was created by humans trying to "manage" the exploitation of fisheries resources. "In terms of engineered outcomes, it's been a disaster."

## Climate Change

Global warming is already affecting polar marine ecosystems. On the Antarctic Peninsula, ice-dependent species like Adelie penguins and Weddell seals have moved southwards, replaced by the Gentoo penguins and elephant seals that prefer open water. Krill, the small marine crustaceans that form the basis of the Antarctic food chain, feed on algae that grow on the underside of winter sea ice. Experts fear less sea ice could mean less krill and, thus, less food to go around.



Getty Images/Norbert Wu

*The Banggai cardinalfish, native to Indonesia, is among hundreds of marine animals and corals added to the World Conservation Union's 2007 "red list" of species in jeopardy or facing high risk of extinction. The group blames excessive and destructive fishing activities for the loss of ocean biodiversity.*

In the Arctic, reduced ice cover is causing starvation and reproductive failure among polar bears, prompting the United States to propose listing them as a threatened species.<sup>54</sup> Walrus and ringed seals also depend on floating ice as habitat.

Fishermen in Greenland have witnessed considerable changes in the composition of the continent's marine species in recent years. Cold-loving shrimp are becoming rarer on the south and west-central coasts, while cod are becoming more numerous. The fishing season is longer in areas where sea ice is failing to form, but polar bear and seal hunters cannot risk going out on the ice with their sled dogs.

"Hunters and fishermen have passed down detailed information about their environment for generations," says Lene Kielsen Holm, director for environment and sustainable development at the Greenland office of the Inuit Circumpolar Council, which represents the interests of the 160,000 Inuit, the indigenous people of the

high arctic. "Now they tell us things are changing so quickly everything they have been taught by their elders is no longer accurate."

Scientists also worry that melting polar glaciers, ice caps and ice sheets could slow ocean circulation. Ocean currents normally act as a conveyor belt, moving warm surface waters toward the poles and cold bottom water from polar areas toward the equator. The release of fresh meltwater alters seawater density, which may slow or even stop circulation, with potentially devastating consequences for human and marine life.

A 2005 study indicated that the Gulf Stream, which keeps northern Europe's climate mild, may have slowed by 30 percent since 1992. "We don't want to say the circulation will shut down, but we are very nervous about our findings," said Harry L. Bryden, a specialist in the role of ocean heat and freshwater currents at the School of Ocean and Earth Science at the National Oceanography Centre in

Southampton, England. “They have come as quite a surprise.”<sup>55</sup>

Meanwhile, the increase in atmospheric carbon dioxide (CO<sub>2</sub>) — one of the major causes of climate change — is making the ocean more acidic, with potentially catastrophic consequences. About 2 billion tons of atmospheric CO<sub>2</sub> ends up in the oceans each year — 10 times the natural rate — and the oceans have become 30 percent more acidic since the Industrial Revolution. That figure is expected to rise to 100 percent to 150 percent by the end of the century.

Increased acidity disrupts the ability of corals and other sea animals to build shells and skeletons. “There’s a whole category of organisms that have been around for hundreds of millions of years that are at risk of extinction,” says Ken Caldeira, a chemical oceanographer at the Carnegie Institution’s Department of Global Ecology at Stanford University. The likely casualties include a range of microscopic creatures at the base of the food chain, including coccolithophores and pteropods; the polyps that build coral reefs; and starfish and sea cucumbers — popular food items for larger creatures. Oysters, scallops, mussels, barnacles and many other creatures may also be affected.

“This is a matter of the utmost importance,” said reef expert Ove Hoegh-Guldberg of the University of Queensland in Australia. “I can’t really stress it in words enough. It is a do-or-die situation.”<sup>56</sup>

## Governing the Seas

---

Historically, the seas were unregulated beyond three nautical miles from land, the effective range of shore-based cannon. But in the 20th century, fishery-dependent Iceland — in an effort to protect its fish from foreign fleets — extended its territorial waters first to four then to 12, 50 and, finally, to 200 nautical miles.

Initially, the world protested. Britain dispatched a fleet of warships to protect its trawlers, triggering three bloodless “cod wars” with Iceland’s coast guard. Shots were fired, ships rammed and nets cut. Iceland barred British warplanes from landing at the NATO air base in Keflavik. Finally, in 1976, the world backed down, and soon nations around the world had declared their own 200-mile zones.<sup>57</sup>

The 200-mile limit was codified in the 1982 U.N. Convention on the Law of the Sea (UNCLOS), which has since been ratified by 155 nations. The United States — which had extended its own territorial waters to 200 miles in 1977 — has not yet ratified the treaty, but President George W. Bush has said it should be ratified.

Under UNCLOS, governments can regulate fishing and other economic activities within their 200-mile “exclusive economic zones” (EEZ) and are expected to take a precautionary approach in utilizing their EEZs “according to their capabilities.” Legal scholars have said the conservation language is so weak as to be useless.

“Just as with bringing up children, a permissive approach to the law of the sea guarantees spoiling,” writes John Charles Kunich, associate professor of law at the Appalachian School of Law in Grundy, Va., and author of *Killing Our Oceans: Dealing with the Mass Extinction of Marine Life*. “It is all too predictable that nations often discover that other pressing needs prevent them . . . from doing anything to protect biodiversity in the oceans.”<sup>58</sup>

Nations have cooperated in trying to regulate international exploitation of marine creatures that regularly cross borders through treaty organizations like the International Whaling Commission, the Northwest Atlantic Fisheries Organization and the International Commission for the Conservation of Atlantic Tuna. But the track record of most of these organizations is poor. In most cases, the populations of species

they are supposed to protect have declined due to predation by humans. Even when member nations agree to tougher enforcement, unscrupulous vessel owners can simply re-register their ships in a “flag-of-convenience” nation that does not observe the relevant rules.

International cooperation has succeeded, however, in banning drift-net fishing — which indiscriminately kills any fish or mammals that come in contact with the massive nets — and the 1975 Convention on International Trade in Endangered Species helped reduce cross-border trade in hawksbill turtles, Caspian sturgeon roe and many whale products. The 1959 Antarctica Treaty has spared the southern continent and much of the surrounding ocean from continued hunting, industrial activity and fishing pressure.

But with most of the more ecologically productive parts of the ocean located within nations’ EEZs, it will likely fall on national governments to protect them. ■

## CURRENT SITUATION

---

### Government Responses

---

World governments have been slow to address the ocean crisis, often stepping in only after a fishery has collapsed. And governments that have closed fishing grounds have had mixed results. While cod stocks on Canada’s Grand Banks have failed to recover, for instance, New England’s haddock, flounder and other species are slowly recovering. Scientists say New England stocks can recover completely if policy makers withstand industry pressure to allow more fishing.

Internationally, China, Iceland, Russia and other deep-sea fishing nations

blocked a 2006 U.N. effort to ban high-seas bottom trawling. "There were several countries that really didn't want any controls at all," said U.S. Assistant Secretary of State for Oceans, Environment and Science Claudia McMurray. "We're very disappointed."<sup>59</sup>

Many countries have considered privatizing fisheries by creating individual transferable quotas (ITQs). Under an ITQ system, scientists set quotas on the total allowable catch for a given season, species and fishing ground; shares of the quotas are bought and sold by private entities, and only those holding shares are allowed to fish.

Proponents say that creating "owners" of uncaught fish will encourage responsible stewardship. Opponents say an ITQ system represents a massive transfer of public resources to corporate control.

"Since quotas are bought and sold to the highest bidder, local fishermen — who can't compete with deep-pocketed corporations — are almost inevitably squeezed out," write Pietro Parravano, past president of the Pacific Coast Federation of Fishermen's Associations, and Lee Crockett, formerly of the Marine Fish Conservation Network and now federal fisheries policy director at the Pew Environment Group. "Moreover, because quotas are [initially] set on the number of fish historically caught by individual fishermen, those who tried to allow stocks to replenish by fishing responsibly [are] penalized, while those who fish rapaciously are rewarded."<sup>60</sup>

Others say ITQ rules can be written to prevent the concentration of ownership. Alaska's halibut and sablefish fisheries adopted ITQs in 1995, but the rules limited absentee ownership and consolidation of shares and allowed communities to buy blocks of shares to divvy up among individuals. A decade later, the fishery was safer and greener, according to Linda Behnken, executive director of the Alaska Longline Fishermen's Association.



U.N. Environmental Program/Topham

*Wastewater runoff from coastal developments is one of many threats to marine habitats. Each summer fertilizer runoff from 31 states in the United States flows into the Gulf of Mexico via the Mississippi River, creating a huge dead zone south of New Orleans where few species survive.*

"From a resource perspective, it's been an unqualified success," she said.<sup>61</sup>

## Zoning the Sea

Some governments have tried to zone the ocean bottom just as cities use zoning rules to separate incompatible land uses and to establish parks and preserves. Environmentalists have long advocated a similar approach, as has the World Bank, the U.S. Commission on Ocean Policy and the Pew Oceans Commission. Seafloor zoning — and establishing marine reserves where certain human activities are prohibited — is also a crucial part of ecosystem-based management.

"It's inevitable that once we developed methods to reach further and further into the sea, we would have to extend the regulatory framework we have on land to the sea," says Callum Roberts, an expert on marine zoning at the University of York in England.

To date, however, less than 2 percent of the oceans are within marine protect-

ed areas, and less than 0.2 percent are classified as no-take marine reserves where no disruptive activities are allowed.<sup>62</sup>

The Central American nation of Belize is leading the way on marine protected areas. With the help of the Global Environment Facility — a joint UN/World Bank environmental grant-making agency based in Washington — and scientists from the United States and Britain, Belize has created a surprisingly comprehensive array of fully protected parks, mixed-use reserves and specialized wildlife sanctuaries aimed at protecting biodiversity while enhancing the country's most important industries: fishing and eco-tourism.<sup>63</sup>

One of the reserves, Glover's Reef, a remote atoll 30 miles offshore, has been fully protected and carefully patrolled for nearly a decade. As a result, depleted commercial seafood species have rapidly rebounded: From 1998 to 2003, queen conch populations jumped by 350 percent and spiny lobster 250 percent. Similar results have been observed in New Zealand, where overall ecological

productivity has jumped 50 percent in a reserve founded in 1977.<sup>64</sup>

“Right now, it’s like we have a few oases in the desert,” says Bill Ballantine, a marine biologist and former director of the University of Auckland’s Leigh Marine Laboratory, who says the world needs many more.

To be effective, Belize’s reserves must be “big enough so that a reasonable number of species can complete their life cycle within its borders, but small enough so the animals inside will produce larvae that wind up outside its borders and seed other fish populations,” says Peter Sale, professor emeritus of biological sciences at the University of Windsor, Ontario.<sup>65</sup>

But there are problems, especially in cash-strapped developing countries like Belize. Running the reserves “is an enormously expensive undertaking,” says Janet Gibson, former director of Belize’s Coastal Zone Management Authority, “and there are really few ways to raise funds apart from charging entrance fees.”

In Indonesia, the U.S.-based Nature Conservancy has provided funding for wardens at Komodo National Park, who have largely driven out the dynamite fishermen who blasted many of the area’s reefs to rubble. Researchers have helped the reefs reestablish themselves by piling sandstone and limestone boulders on the sea floor. “Places that were just bare rock and rubble now have great coral growth and are surrounded by fish,” says the World Wildlife Fund’s senior marine conservation biologist Helen E. Fox, who worked on the project. The technique costs only about \$5 per square meter, compared to between \$550 and \$10,000 to repair corals in the Florida Keys, she says.

In 2006, President Bush created the world’s largest fully protected reserve, the 138,000-square-mile Papahānaumokuākea Marine National Monument in the northwestern Hawaiian Islands. The new reserve — 100 times the size of Yosemite National Park and larger than all other

U.S. national parks combined — prohibits all exploitative activities except for limited ritualistic fishing by native Hawaiians. Environmentalists and ocean policy advocates widely praised the move, called by Fred Krupp, president of Environmental Defense, “as important as the establishment of Yellowstone.”<sup>66</sup>

Some fishermen fear large areas could be declared reserves and closed to fishing. But proponents note that creating a reserve doesn’t necessarily preclude fishing; it can, however, restrict fishing by method, times or places.

“What you zone for depends on what you are trying to protect,” says Anthony Chatwin, director of the South American marine program at The Nature Conservancy. “Some areas will be reserved to protect marine biodiversity, others purely for fisheries management purposes, but they will be comprehensively put together.”

## Managing Better?

Some experts have identified examples of sustainable fisheries — those that work within the limits of what marine ecosystems can support. Most include community-based management, in which local communities develop their own rules for how, when and by whom the grounds can be fished.

In the Maine lobster fishery, for instance, catches remain at all-time highs despite an enormous increase in the number of fishermen and traps. Traditionally, lobstermen from each harbor controlled their own piece of the seafloor and defended it from intrusion by anyone without the community’s permission. By controlling their own lobster pasture, the fishermen had an incentive to enforce or even enhance conservation laws, according to James Acheson, an anthropologist at the University of Maine. “The whole theory of common property resources like lobster assumes they’re bound to be overexploited,” he says. “That’s nonsense.”<sup>67</sup>

Numerous other successful fisheries have similar arrangements, from the coral reefs of Micronesia and Polynesia (where villages control fishing rights to nearby reefs) to the community fishing cooperatives that control inshore grounds in Japan’s Ryukyu Islands. They have inspired others to advocate giving fishing communities proprietary rights to the resources they have long relied on in Atlantic Canada and elsewhere.<sup>68</sup>

Molyneaux, the author and former fisherman who received a Guggenheim Fellowship to study sustainable fisheries, points to Chile, where the government has blended privatization with community-based management. Small-scale fishermen are allowed to form unions, which are allocated a slot of ocean bottom. The government sets quotas on commercial species, but the union members decide how to manage the area.

“You don’t get sole access to the fish but rather to the sedentary resources: shellfish, seaweed, abalone,” says Molyneaux. “It’s a form of privatization, but it’s community based and intended to keep fishermen in their communities and not moving to shantytowns in the cities.”

The unions pay for scientific assessments of the health of their stock but are left to work out the economic strategy for harvesting it. “They figured out how to give people the power to control and promote the resource, a reason for promoting sustainability,” he says.

Some fishing gear is clearly less harmful than others. Maine lobstermen fish with baited traps that don’t harm juvenile lobsters, oversized lobsters, non-target species or the ocean floor. New Brunswick weir fishermen capture herring in hand-built fish traps, with the rights to use a given location handed down in families. Some Icelandic fishermen combine high-tech with small-scale: fishing from small, locally built boats with hand-baited, computer-tended longlines, sophisticated electronic

*Continued on p. 258*

## *Should the moratorium on commercial whaling be lifted?*



**RUNE FRØVIK**  
*CEO, HIGH NORTH ALLIANCE, NORWAY*

WRITTEN FOR *CQ GLOBAL RESEARCHER*,  
SEPTEMBER 2007

**W**hile fishing continues to enjoy almost universal acceptance as a means of food production, Western urban society has decided unilaterally to shut down whaling with complete disregard for any culture that still practices it.

Each culture has its own culinary idiosyncrasies. For many Asians, dog meat is a delicacy; the French like their frogs, snails and horse meat, and Australians have a taste for kangaroos. And there are just as many taboos — Indians forego the joy of beefsteak, while Jews and Muslims won't touch pork.

Beset with environmental challenges and yet respectful of cultural differences, the world community thankfully embraced Agenda 21's principle of striving for sustainable development — using renewable resources at rates that are within the resources' capacity for renewal.\* Yet the West's cultural imperialists would have whales exempted from the sustainable-use principle — placing them above and apart from the animal kingdom to which they obviously belong.

For those who live close to nature, natural resources play vital roles, both nutritional and cultural, in their lives. Thus, coastal people will continue to harvest what nature provides — be it seals, fish, birds . . . or whales. And in the interest of self-preservation, they will strive to do so sustainably.

Sustainable whaling must be managed in accordance with agreed principles, not by launching destructive attacks on those who engage in exactly what we are striving for — sustainable use — just because one's cultural bias finds a particular harvest unpalatable.

In a world where trade depends on the exchange of money, there are commercial aspects to whalers' lives. In Greenland, Iceland, Japan and Norway whale meat is sold in supermarkets, and expensive whale souvenirs are sold to tourists in Alaska. Until whale meat is accepted as currency, whalers must do their shopping the same way as the rest of us — with cash.

Harvesting nature's surplus, including super-abundant whale resources, means biodiversity and habitat do not have to be destroyed and turned into agricultural land. True environmentalists are concerned not with appearances but with practicing the principles that they preach. In so doing, they have either reached the conclusion, or are getting there, that whaling should not only be continued but should even be increased to provide more people with ecological, healthy and nutritious food.

\* Agenda 21 — adopted by more than 178 governments at the Earth Summit in June 1992 — is a 300-page plan for achieving sustainable development in the 21st century.



**PHILIPPA BRAKES**  
*SENIOR BIOLOGIST, WHALE AND DOLPHIN CONSERVATION SOCIETY*

WRITTEN FOR *CQ GLOBAL RESEARCHER*,  
SEPTEMBER 2007

**t**he unbridled ravages of commercial whaling — which brought several whale populations to the brink of extinction and significantly depleted many others — should serve as a grave warning to the dangers of the poorly regulated exploitation of marine mammals.

The moratorium was intended to allow whale populations to recover to pre-exploitation levels. Since the moratorium was implemented, however, we have learned what we know and what we don't know about whale populations. We have learned that it's difficult to accurately estimate whale populations and that whales now face new threats from noise and chemical pollution, ship strikes, loss of critical habitat, entanglement in fishing gear and, more recently, challenges due to climate change. All of these threats may influence recovery of whale populations.

Even if the threats to whale populations could be adequately mitigated, many question whether commercial whaling could ever, realistically, be well regulated. The lessons of history — and the burgeoning exploitation of the moratorium's loophole for "scientific" whaling — lead us to conclude that this is unlikely.

Moreover, grave concerns remain as to whether whaling could ever be conducted humanely. Since commercial whaling is conducted for profit, it is argued with good reason that whaling should be held accountable to the same standards for humane slaughter as other animals killed for commercial purposes. It is difficult — even, unpleasant — to imagine a situation in which an animal could escape and be lost during slaughter in an abattoir and be left to die of its injuries. Yet, whales that are injured and escape remain a permanent feature of all whaling practices.

In addition, there are also much broader ethical issues at stake: In the 21st century, many people, even some cultures, no longer view whales as a resource to be exploited but as social beings, with complex lives that should be afforded protection of their interests, not because of their potential value to humankind but because of their own value in and of themselves.

Perhaps rather than asking whether the moratorium should be lifted, the global community should now turn its attention to closing the legal loopholes that permit whaling under objection and whaling for "scientific" purposes, and we should instead ask how we can secure a brighter future for our seaborne cousins so they are protected from commercial hunting permanently.

*Continued from p. 256*

bottom maps and the capability to sell their catch electronically hours before they ever reach the dock.

Others say conventional gear and management can work, pointing to Alaska, where fisheries managers have prevented overfishing, reduced bycatch and protected habitats. By 2005, the North Pacific Fisheries Management Council — which includes fishing interests, scientists and public officials — had banned bottom trawling in nearly 40 percent of Alaska's federal waters and imposed fishing closures to protect the spawning and nursery grounds of herring, rockfish, crab and other commercial species.

Unlike its New England counterpart, the council never authorized catch quotas above those recommended by its scientific advisers. It also restricted fishing near Stellar sea lion rookeries. Federal managers also banned targeted fishing of key forage species like smelt, capelin and sand lance that feed seabirds and commercial fish.

"People in Alaska had been through some tough times in the past, and they created an ethic that puts protecting the resource first," said Benton of the Marine Conservation Alliance. "People around the world acknowledge Alaska as one of those places where you can look for positive lessons learned." <sup>69</sup>

## Saving the Shore

---

Policy makers are paying considerable attention to calls to develop integrated coastal zone management plans that control human activities throughout an entire watershed and its associated coastline and estuaries.

Three-quarters of the ocean's pollution comes from land-based human activity, and the problem is getting worse. Half of the world's population lives within 62 miles of the coast; in Southeast Asia it's two-thirds. In the United States,

53 percent of the population lives in coastal counties that comprise only 17 percent of the country's landmass. Nine of the world's 10 largest cities are on the coast, and coastal population growth is expected to greatly exceed overall trends. <sup>70</sup> Already, 20th-century development activities have destroyed half of all coastal wetlands. <sup>71</sup>

Reengineering rivers compounds the problem with polluted watersheds. Egypt's Aswan High Dam cut off the flow of nutrients to the Nile Delta, causing the sardine catch to plummet from 18,000 to 600 tons in three years. In Louisiana, decades of levee- and channel-building by the Army Corps of Engineers has transformed the Mississippi River into a ditch that shunts fertilizers and sewage directly into the Gulf of Mexico. And by preventing the river from dropping silt in its delta, the levees are causing the Louisiana bayous to disappear into open water at the rate of 25-35 square miles a year. <sup>72</sup>

"The loss of Louisiana's marshes will incrementally destroy the economy, culture, ecology and infrastructure, not to mention the corresponding tax base of this state and this region," said banker King Milling, chairman of the state-appointed Committee on the Future of Coastal Louisiana. <sup>73</sup>

The U.S. Commission on Ocean Policy and the Pew Oceans Commission have called for integrated, watershed-wide planning in the United States. If implemented, the model might again draw on the experience of Belize, which found that protecting coral reefs required addressing problems far inland.

"To protect the reefs — or any other ecosystem for that matter — you have to take . . . an ecosystem approach," said Gibson, the former head of Belize's Coastal Zone Management Authority (CZMA). "You need to look at pollution in the watersheds, at coastal construction and urban expansion, at fisheries and forest loss, at the effects of tourism and air pollution.

"If there isn't coordination between economic sectors, your efforts to conserve an ecological system are not going to be successful," she continued. The CZMA has coordinated policies governing forestry, fisheries and water quality while sponsoring education programs to show people how rivers, mangroves, cays and reefs interact. Other countries have made advances in creating integrated coastal zone management plans. Australia created a national framework to integrate its state, territorial, regional and local government agencies to manage resources on a river-basin-by-river-basin level. <sup>74</sup> In 2002, the European Union recommended that member states move towards integrated management. A 2007 review found "a positive impact in stimulating progress" but acknowledged it would be a "slow and long-term process." Most member states hadn't adopted national strategies until 2006; six had not done so at all. <sup>75</sup> ■

## OUTLOOK

---

### Out of Mind

---

The oceans have never gotten the political attention they need, and after the Sept. 11, 2001, terrorist attacks, they seemed to sink even lower on the world's priority list.

"We are moving forward extremely slowly, and in fact we are actually retreating from some of the movement we had toward more concerted international action," says Mee of the University of Plymouth. "There's been concentration on other issues: terrorism, in particular, and security."

Ironically, the urgent attention being focused on climate change has further eclipsed the oceans' problems. "Action by celebrity figures like [former Vice

President] Al Gore has managed to put climate change on the agenda and kept it there very effectively,” says Mee. “We don’t really have many champions for the marine environment. The oceans don’t make it onto people’s agenda, resulting in the feeling that action can be postponed.”

The United States is a case in point. The chairmen of the Pew Oceans Commission and the U.S. Commission on Ocean Policy joined forces to press for implementation of their recommendations, including issuing “report cards” grading governments’ progress. The U.S. government got a D+ in 2005 and a C- in 2006, reflecting modest progress.

“The improvement is largely attributable to state action and a few notable federal accomplishments,” explained Admiral Watkins and Panetta.<sup>76</sup>

States and regional organizations received an A- after 18 took steps to develop comprehensive strategies for protecting marine systems. But there was little progress in most areas. Even modest programs to establish ocean observation systems (which collect basic oceanographic information) or to monitor and protect the endangered North Atlantic right whale have seen drastic funding cuts in the past year. Getting attention for oceans issues will remain challenging due to the lack of public awareness of the problems, and other congressional priorities, such as the Iraq War.

Internationally, even problems that aren’t that difficult to solve have been put on the backburner. For instance, many of the disruptions caused by alien species could be prevented if the shipping industry adopted a ballast water-exchange program in which ballast water is pumped to and from sterilized sources rather than into local harbors.

“It costs people money,” notes Mee. “It’s a tiny marginal cost on transportation, but it requires a greater sense of purpose to push it through.”

In the future, the world community is expected to focus more attention on the negative impact China’s burgeoning industrialization is having on the world’s oceans. According to the World Wildlife Fund, China is now the largest polluter of the Pacific Ocean. Each year China releases about 2.8 billion tons of contaminated water into the Bo Hai — a sea along China’s northern coast — and the heavy metal content of Bo Hai bottom mud is now 2,000 times as high as China’s official safety standard. In 2006, heavily industrialized Guangdong and Fujian provinces discharged nearly 8.3 billion tons of untreated sewage into the ocean — up 60 percent since 2001. More than 80 percent of the East China Sea — one of the world’s largest fisheries — is now rated unsuitable for fishing, and the Chinese prawn catch has plunged 90 percent over the past 15 years.<sup>77</sup>

Bill Wareham, acting director of the Marine Conservation Program at Canada’s David Suzuki Foundation, is pessimistic international agencies will cooperate, citing the refusal in 2006 by China, Russia and other deep-sea fishing nations to support the U.N.’s measure to ban trawling.

If the world cannot depend on the U.N. to mandate the protection of fish habitat and to prevent the ongoing decline of high seas fish stocks, “then we are in a very sad state,” he said. “The global governance system has failed to move past the stage of denial.”<sup>78</sup> ■

## Notes

<sup>1</sup> John W. Miller, “Global fishing trade depletes African waters,” *The Wall Street Journal*, July 18, 2007, p. A1.

<sup>2</sup> “State of World Fisheries and Aquaculture 2006,” Food and Agriculture Organization, 2007.

<sup>3</sup> Ransom A. Myers and Bruce Worm, “Rapid Worldwide Depletion of Predatory Fish Communities,” *Nature*, May 15, 2003, p. 280.

<sup>4</sup> Kenneth R. Weiss, “A primeval tide of toxins,” *Los Angeles Times*, July 30, 2006, p. 1.

<sup>5</sup> See Kieran Kelleher, “Discards in the world’s marine fisheries: An update,” Technical Paper 470, Food and Agriculture Organization, 2005, pp. xvi, 38.

<sup>6</sup> Eleanor M. Dorsey and Judith Pederson, *Effects of Fishing Gear on the Sea Floor of New England*, Conservation Law Foundation (1998), pp. 1-6.

<sup>7</sup> Clive Wilkinson (ed.), *Status of Coral Reefs of the World: 2004, Vol. 1*, Australian Institute for Marine Science, 2004, p. 7.

<sup>8</sup> Colin Woodard, *Ocean’s End: Travels Through Endangered Seas* (2000), pp. 144-160.

<sup>9</sup> *Ibid.*, pp. 44-45, 156; “Research reveals virus link in deaths of reefs,” *Evening Herald* [Plymouth, England], May 2, 2007, p. 13.

<sup>10</sup> Anne Platt McGinn, “Safeguarding the Health of the Oceans,” Worldwatch Institute, 1999, pp. 26-27.

<sup>11</sup> For background, see Marcia Clemmitt, “Saving the Oceans,” *CQ Researcher*, Nov. 4, 2005, pp. 933-956.

<sup>12</sup> For a detailed discussion see Woodard, *op. cit.*, pp. 97-129.

<sup>13</sup> For background, see David Hosansky, “Invasive Species,” *CQ Researcher*, Oct. 5, 2001, pp. 785-816.

<sup>14</sup> Colin Woodard, “Battling killer seaweed,” *The Chronicle of Higher Education*, Aug. 2, 2002, p. 14.

<sup>15</sup> Kenneth R. Weiss, “Dark tides, ill winds,” *Los Angeles Times*, Aug. 1, 2006, p. 1; Weiss, *op. cit.*; Jeremy B. C. Jackson, “Habitat destruction and ecological extinction of marine invertebrates,” 2006, <http://cbc.amnh.org/symposia/archives/expandingthearc/speakers/transcripts/jackson-text.html>; see also Frances M. Van Dolah, “Marine Algal Toxins: Origins, Health Effects, and Their Increased Occurrence,” *Environmental Health Perspectives Supplements*, March 2000, [www.ehponline.org/members/2000/suppl-1/133-141vandolah/vandolah-full.html](http://www.ehponline.org/members/2000/suppl-1/133-141vandolah/vandolah-full.html).

<sup>16</sup> “Major study predicts bleak future for Europe’s seas,” University of Plymouth press release, June 7, 2007.

<sup>17</sup> “Current trends project collapse of currently fished seafoods by 2050,” National Science Foundation press release, Nov. 2, 2006.

<sup>18</sup> Clemmitt, *op. cit.*

<sup>19</sup> Testimony of Admiral James D. Watkins before the U.S. Senate Committee on Commerce, Science and Transportation, April 22, 2004, p. xi, [http://govinfo.library.unt.edu/oceancommission/newsnotices/prelim\\_testimony.html](http://govinfo.library.unt.edu/oceancommission/newsnotices/prelim_testimony.html).

<sup>20</sup> “1,600+ scientists warn that the sea is in peril, call for action now,” Marine Conservation Biology Institute press release, Jan. 6, 1998, [www.gdrc.org/oceans/troubled.html](http://www.gdrc.org/oceans/troubled.html).

<sup>21</sup> Quoted in Clemmitt, *op. cit.* Furlong was citing the “Fish Stocks Sustainability Index” of the National Oceanographic and Atmospheric Administration’s Fisheries Service, April 1-June 30, 2007, [www.nmfs.noaa.gov/sfa/domestic\\_fish/StatusofFisheries/2006/3rdQuarter/Q3-2006-FSSIDescription.pdf](http://www.nmfs.noaa.gov/sfa/domestic_fish/StatusofFisheries/2006/3rdQuarter/Q3-2006-FSSIDescription.pdf).

<sup>22</sup> Bjorn Lomborg, *The Skeptical Environmentalist* (2001), pp. 189, 201, 329.

<sup>23</sup> *Ibid.*

<sup>24</sup> Edie Clark, “Ted Ames and the Recovery of Maine Fisheries,” *Yankee Magazine*, November 2006.

<sup>25</sup> Colin Woodard, “Saving Maine,” *On Earth*, Summer 2003.

<sup>26</sup> Testimony before U.S. House Natural Resources Subcommittee on Fisheries, Wildlife and Oceans, April 26, 2007, [www.jointoceancommission.org/images/Rosenberg\\_testimony\\_H.R.21\\_04\\_26\\_07.pdf](http://www.jointoceancommission.org/images/Rosenberg_testimony_H.R.21_04_26_07.pdf).

<sup>27</sup> Wayne A. Morrisey, “Science Policy and Federal Ecosystem-based Management,” *Ecological Applications*, August 2006, pp. 717-720; D. S. Slocombe, “Implementing ecosystem-based management,” *Bioscience*, Vol. 43 (1993), pp. 612-622; U.S. Department of Commerce, *The Ecosystem Approach: Vol. I*, June 1995.

<sup>28</sup> Kenneth R. Weiss, “Study urges trawling ban in fragile marine habitats,” *Los Angeles Times*, March 19, 2002, p. 12; Joe Haberstroh, “The bottom of the trawling matter,” *Newsday*, March 31, 2002, p. 31; Jeremy Collie, *et al.*, Effects of Trawling and Dredging on Sea Floor Habitat, National Research Council, March 2002.

<sup>29</sup> Glen Whiffen, “Dragging technology hurts: advocate,” *St. John’s Telegram* [Newfoundland], May 4, 2005, p. A4.

<sup>30</sup> U.N. General Assembly, “The Impacts of Fishing on Vulnerable Marine Ecosystems,” July 14, 2006, [www.un.org/Depts/los/general\\_as-](http://www.un.org/Depts/los/general_assembly/documents/impact_of_fishing.pdf)

[sembly/documents/impact\\_of\\_fishing.pdf](http://www.un.org/Depts/los/general_assembly/documents/impact_of_fishing.pdf); John Heilprin, “UN ban on bottom trawling fails,” *Houston Chronicle*, Nov. 25, 2006, p. 2.

<sup>31</sup> “America’s Living Oceans: Charting a course for sea change,” Pew Oceans Commission, May 2003, p. 47, [www.pewtrusts.org/uploaded-Files/wwwpewtrustsorg/Reports/Protecting\\_ocean\\_life/env\\_pew\\_oceans\\_final\\_report.pdf](http://www.pewtrusts.org/uploaded-Files/wwwpewtrustsorg/Reports/Protecting_ocean_life/env_pew_oceans_final_report.pdf).

<sup>32</sup> “NZ to close 30pc of waters to trawling,” New Zealand Press Association, Feb. 14, 2006.

<sup>33</sup> Jeff Barnard, “Seafloors fished by trawlers hold fewer kinds of fish,” *The Associated Press*, April 18, 2007.

<sup>34</sup> Milan Ilnyckyj, “The legality and sustainability of European Union fisheries policy in West Africa,” *MIT International Review*, Spring 2007, pp. 33-41, <http://web.mit.edu/mitir/2007/spring/fisheries.html>.

<sup>35</sup> Kim Willsheer, “Mauritians rue EU fish deal with a catch,” *The Guardian*, Feb. 9, 2001.

<sup>36</sup> Stephen Castle, “EU Trawlers get fishing rights off Africa for pounds 350m,” *The Independent*, July 24, 2006.

<sup>37</sup> Haberstroh, *op. cit.*, p. A23; James Kendall, “Scallop dredge fishing,” in Dorsey and Pederson, *op. cit.*, pp. 90-93.

<sup>38</sup> M. J. Kaiser and B. E. Spencer, “The effects of beam-trawl disturbance on infaunal communities in different habitats,” *Journal of Animal Ecology*, Vol. 65 (1996), pp. 348-358; A.D. Rijnsdorp and P. I. Van Leewen, “Changes in growth of North Sea plaice since 1950 in relation to density, eutrophication, beam trawl effort, and temperature,” *ICES Journal Marine Science*, Vol. 53 (1996), pp. 1199-1213; R. S. Millner and C. L. Whiting, “Long-term changes in growth and population abundance of sole in North Sea from 1940 to present,” *ICES Journal Marine Science*, Vol. 53 (1996), pp. 1185-1195.

<sup>39</sup> Haberstroh, *op. cit.*, p. A23. Also see “The impact of bottom trawling on American lobsters off Duxbury Beach, MA,” Massachusetts Division of Marine Fisheries, Oct. 1, 1989.

<sup>40</sup> For background see Clemmitt, *op. cit.*, p. 946.

<sup>41</sup> Colin Woodard, *The Lobster Coast* (2004), pp. 201-207; William Warner, *Distant Water* (1977), pp. 50-53.

<sup>42</sup> Woodard, *ibid.*, p. 204.

<sup>43</sup> Warner, *op. cit.*, pp. 52-53.

<sup>44</sup> Marcus Gee, “Here’s a fine kettle of . . .,” *Globe & Mail* [Toronto], May 16, 2003, p. A23; Woodard, *ibid.*, pp. 223-231.

<sup>45</sup> Michael Temelini, “The Rock’s newfound nationalism,” [Toronto] *Globe & Mail*, June 29, 2007, p. A17.

<sup>46</sup> For background, see Michael Harris, *Lament for an Ocean* (1998); Woodard, 2004, *op. cit.*, pp. 223-231.

<sup>47</sup> “Fishers fear tough catch curbs again after cod-stocks claim,” *Aberdeen Press and Journal*, Oct. 23, 2001, p. 19; John McQuaid, “Overfished waters running on empty,” *New-Orleans Times-Picayune*, March 24, 1996, p. A39.

<sup>48</sup> Carl Safina, “Fishing off the deep end — and back,” *Multinational Monitor*, Sept. 1, 2003, p. 8.

<sup>49</sup> Anne Platt McGinn, “Rocking the Boat,” Worldwatch Institute, June 1998, pp. 43-44.

<sup>50</sup> Margaret Munro, “Fuel subsidies keep trawlers ‘strip-mining’ sea,” *Vancouver Sun*, Nov. 17, 2006, p. A3; see also U. R. Sumaila and D. Pauly, (eds.), “Catching more bait: a bottom-up re-estimation of global fisheries subsidies,” Fisheries Centre Research Reports 14(6), p. 2. University of British Columbia, [www.fisheries.ubc.ca/members/dpauly/chaptersInBooksReports/2006/ExecutiveSummaryCatchingMoreBait.pdf](http://www.fisheries.ubc.ca/members/dpauly/chaptersInBooksReports/2006/ExecutiveSummaryCatchingMoreBait.pdf).

<sup>51</sup> Patricia J. James, “Cousteau says lack of care impacts sea,” *Telegram & Gazette* (Mass.), May 12, 2006, p. B1.

<sup>52</sup> The Serengeti — a vast plain stretching from Kenya to northern Tanzania — is famous for its extensive wildlife.

<sup>53</sup> Jeremy B. C. Jackson, “What was natural in the coastal oceans?” Proceedings of the National Academy of Sciences, May 8, 2001, pp. 5412-3; Woodard, 2000, *op. cit.*, pp. 160-161.

<sup>54</sup> Woodard, *ibid.*, pp. 208-215; Juliet Eilperin, “US wants polar bears listed as threatened,” *The Washington Post*, Dec. 27, 2006, p. 1.

<sup>55</sup> Fred Pearce, “Failing ocean circulation raises fears of mini ice-age,” NewScientist.com news service, Nov. 30, 2005, <http://media.newscientist.com/article.ns?id=dn8398>.

<sup>56</sup> Elizabeth Kolbert, “The darkening sea,” *The New Yorker*, Nov. 20, 2006, p. 67; Usha Lee McFarling, “A chemical imbalance,” *Los Angeles Times*, Aug. 3, 2006, p. 1.

<sup>57</sup> Woodard, 2004, *op. cit.*, pp. 212-213.

<sup>58</sup> John Charles Kucinich, *Killing Our Oceans:*



## About the Author

**Colin Woodard** has reported from more than 40 foreign countries on six continents and lived in Eastern Europe for more than four years. He is the author of *Ocean's End: Travels Through Endangered Seas*, a narrative, non-fiction account of the deterioration of the world's oceans. He also writes for *The Christian Science Monitor* and *The Chronicle of Higher Education*. His previous *CQ Global Researcher* was on climate change.

*Dealing with the Mass Extinction of Marine Life* (2006), pp. 56-57.

<sup>59</sup> "World Digest," *The Capital* (Annapolis, Md.), Nov. 25, 2006, p. A2.

<sup>60</sup> Petro Parravano and Lee Crockett, "Who should own the oceans?" *San Francisco Chronicle*, Sept. 25, 2000.

<sup>61</sup> See Clemmitt, *op. cit.*, p. 941.

<sup>62</sup> Jane Lubchenco, "Global changes for life in oceans," Conference presentation, *M/S Fram* off Greenland, Sept. 8, 2007; Jon Nevill, "Marine no-take areas: How large should marine protected area networks be?" white paper, Sept. 4, 2006, available from [www.onlyoneplanet.com.au](http://www.onlyoneplanet.com.au).

<sup>63</sup> For background, see Rachel S. Cox, "Eco-tourism," *CQ Researcher*, Oct. 20, 2006, pp. 865-888.

<sup>64</sup> For background see Colin Woodard, "Belizean bonanza," *The Chronicle of Higher Education*, July 2, 2004, <http://chronicle.com/subscribe/login?url=/weekly/v50/i43/43a01301.htm>.

<sup>65</sup> *Ibid.*

<sup>66</sup> "U.S. Ocean Policy Report Card," Joint Ocean Commission Initiative, February 2007, [www.jointoceancommission.org/images/report-card-06.pdf](http://www.jointoceancommission.org/images/report-card-06.pdf); Colin Woodard, "Faraway, natural and beautiful and it will stay that way," *Trust*, Fall 2006, pp. 2-11.

<sup>67</sup> For a full discussion, see Woodard, *The Lobster Coast*, *op. cit.*, pp. 267-273.

<sup>68</sup> John Cordell, ed., *Sea of Small Boats, Cultural Survival* (1989), pp. 337-367; R.E. Johannes, "Traditional Law of the Sea in Micronesia," *Micronesica*, December 1977, pp. 121-127; Janice Harvey and David Coon, "Beyond the Crisis in the Fisheries: A proposal for community-based ecological fisheries management," Conservation Council of New Brunswick, 1997.

<sup>69</sup> Brad Warren, "Conserving Alaska's Oceans," Marine Conservation Alliance, 2006, [www.marineconservationalliance.org/news/1359\\_MCA\\_Report\\_for\\_download.pdf](http://www.marineconservationalliance.org/news/1359_MCA_Report_for_download.pdf).

<sup>70</sup> "Population Trends Along the Coastal United States 1980-2003, National Oceanographic and Atmospheric Administration, March 2005.

<sup>71</sup> Peter Weber, "Abandoned Seas: Reversing the Decline of the World's Oceans," Worldwatch Institute, November 1993, pp. 17-24, [www.worldwatch.org/node/874](http://www.worldwatch.org/node/874); Woodard, 2000, *op. cit.*, p. 45.

<sup>72</sup> Woodard, *ibid.*, p. 116.

<sup>73</sup> Weber, *op. cit.*, p. 20; Pew Oceans Commission, *op. cit.*, p. 54.

<sup>74</sup> "National Cooperative Approach to Integrated Coastal Zone Management," National Resource Management Ministerial Council, 2006, [www.environment.gov.au/coasts/publications/framework/pubs/framework.pdf](http://www.environment.gov.au/coasts/publications/framework/pubs/framework.pdf).

## FOR MORE INFORMATION

**Belize Coastal Zone Management Institute**, P.O. Box 1884; Belize City, Belize; Central America; +1-501-223-0719; [www.coastalzonebelize.org](http://www.coastalzonebelize.org). Coordinates policies that will affect the health of Belize's barrier reef system.

**Black Sea Ecosystem Recovery Project**, [www.bserp.org](http://www.bserp.org). A network of scientists and policy experts sponsored by the U.N. Development Program.

**Canadian Department of Fisheries and Oceans**, 200 Kent St., 13th Floor, Station 13228; Ottawa, Ontario, Canada K1A 0E6; 613-993-0999; [www.dfo.ca](http://www.dfo.ca). Manages Canada's fisheries, oceans and marine research.

**International Whaling Commission**, The Red House, 135 Station Road, Impington, Cambridge, CB24 9NP, United Kingdom; +44-1223-233-971; [www.iwcoffice.org](http://www.iwcoffice.org). Regulates whaling and the conservation of whales.

**Joint Ocean Commission Initiative**, c/o Meridian Institute, 1920 L St., N.W., Suite 500, Washington, DC 20036-5037; (202) 354-6444; [www.jointoceancommission.org](http://www.jointoceancommission.org). A vehicle for the chairs of the Pew Oceans Commission and U.S. Commission on Ocean Policy to push implementation of their recommendations.

**National Fisheries Institute**, 7918 Jones Branch Dr., Suite 700, McLean, VA 22102; (703) 752-8880; [www.nfi.org](http://www.nfi.org). The main lobbying and advocacy association for commercial fishing and seafood processing industries in the United States.

**National Marine Fisheries Service**, 1315 East-West Highway, Silver Spring, MD 20910; (301) 713-2239; [www.nmfs.noaa.gov](http://www.nmfs.noaa.gov). U.S. federal agency responsible for the management of fisheries and international fishing agreements.

**Oceana**, 2501 M Street, N.W., Suite 300, Washington, DC 20037-1311; (202) 833-3900; [www.oceana.org](http://www.oceana.org). The world's largest oceans-based environmental group, with branch offices in Europe, South America and the U.S. West Coast.

**Ocean Conservancy**, 1300 19th St., N.W., Washington, DC 20036; (202) 429-5609; [www.oceanconservancy.org](http://www.oceanconservancy.org). Nonprofit organization promoting healthy and diverse ocean ecosystems and opposing practices that threaten ocean life.

**Pew Institute for Ocean Science**, 126 East 56th St., New York, NY 10022; (212) 756-0042; [www.pewoceanscience.org](http://www.pewoceanscience.org). A Pew-funded body that conducts, supports, and disseminates scientific information on protecting the world's oceans.

**Seaweb**, 8401 Colesville Road, Suite 500, Silver Spring, MD 20910; (301) 495-9570; [www.seaweb.org](http://www.seaweb.org). Environmental advocacy group promoting ocean conservation, with branch offices in London and Paris.

**The Shark Alliance**, Rue Montoyer 39, 1000 Brussels, Belgium; [www.sharkalliance.org](http://www.sharkalliance.org). A continent-wide coalition of nongovernment organizations working to save Europe's sharks.

**University of British Columbia Fisheries Centre**, 2202 Main Mall, University of British Columbia, Vancouver, B.C.; Canada V6T 1Z4; 604-822-2731; [www.fisheries.ubc.ca](http://www.fisheries.ubc.ca). Leading fisheries research institution and home to the scientists who predict the world is facing "seas of slime" and may end up "fishing down the marine food webs."

<sup>75</sup> "Report to the European Parliament and Council: An evaluation of ICZM in Europe," European Commission, June 7, 2007, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=C.ELEX:52007DC0308:EN:NOT>.

<sup>76</sup> Leon Pannetta and James Watkins, "State's map for saving the oceans," *The Washington Post*, Feb. 3, 2007, p. A15.

<sup>77</sup> See Elizabeth C. Economy, "The Great Leap Backward?" *Foreign Affairs*, September/October 2007, pp. 38-59.

<sup>78</sup> James Vassallo, "Canada becoming a 'pariah' over trawling," *Prince Rupert Daily News* (BC), Nov. 28, 2006, p. 2.

# Bibliography

## Selected Sources

### Books

**Acheson, James M., *Capturing the Commons: Devising Institutions to Manage the Maine Lobster Industry*, University Press of New England, 2003.**

An anthropologist examines the successes of Maine's lobster fishery and state efforts to incorporate traditional lobster-fishing practices into law.

**Barker, Rodney, *And the Waters Turned to Blood*, Simon & Schuster, 1997.**

An investigative journalist chronicles the rise of a dangerous marine microorganism in the Mid-Atlantic region of the United States and efforts to contain it.

**Ellis, Richard, *The Empty Ocean*, Island Press, 2004.**

The author of more than 10 books on the oceans and a research associate at the American Museum of Natural History in New York uses history, anecdote and stunning facts to chronicle humanity's predation on the oceans.

**Fujita, Rodney M., *Heal the Ocean: Solutions for Saving Our Seas*, New Society Publishers, 2003.**

A marine ecologist describes successful efforts to confront the problems in the world's oceans.

**Meinesz, Alexandre, *Killer Algae: The True Tale of a Biological Invasion*, University of Chicago Press, 1999.**

The scientist who discovered the problem of *Caulerpa taxifolia*, the "killer seaweed" that is taking over the Mediterranean, gives a first-hand account of how bad an invading species can be.

**Molyneux, Paul, *The Doryman's Reflection: A Fisherman's Life*, Avalon, 2005.**

A former commercial fisherman gives a personal account of the collapse of U.S. fisheries, with critical insights into the mindset and values that destroyed a beloved culture.

**Warner, William, *Distant Water: The Fate of the North Atlantic Fishermen*, Little, Brown, 1977.**

The classic account of the rise of factory trawlers and the damage they did prior to the advent of 200-mile limits.

**Woodard, Colin, *Ocean's End: Travels through Endangered Seas*, Basic Books, 2000.**

The author, a freelance journalist specializing in ocean issues, describes the degradation of the world's oceans.

### Articles

**Garrison, Virginia, et al., "African and Asian dust: from desert soils to coral reefs," *Bioscience*, May 1, 2003.**

Scientists hypothesize that the world's coral reefs may be dying because of dust from African desertification.

**Kolbert, Elizabeth, "The Darkening Sea," *The New Yorker*, Nov. 20, 2006.**

The author provides a detailed and readable account of what carbon emissions are doing to the ocean through acidification.

**Kunzig, Robert, "Twilight of the Cod," *Discover*, April 1995.**

Kunzig chronicles the collapse of the New England and Newfoundland cod fisheries in the late 1980s.

**Weiss, Kenneth R., et al., "Altered Oceans," *Los Angeles Times*, July 30-Aug. 3, 2006.**

In a Pulitzer Prize-winning series, Weiss and others describe the oceans' demise, with emphasis on the "rise of slime."

### Reports and Studies

**Dorsey, Eleanor, and Judith Pederson (eds.), *Effects of Fishing Gear on the Sea Floor of New England*, Conservation Law Foundation, 1998.**

This report catalogs the damage caused by bottom trawlers, as viewed by scientists, environmentalists and fishermen.

**Harvey, Janice, and David Coon, "Beyond the Crisis in the Fisheries: A proposal for community-based ecological fisheries management," Conservation Council of New Brunswick, 1997.**

A groundbreaking report by the Canadian conservation council argues for giving proprietary ownership of fishing resources to the local communities that have relied on them.

**Pew Oceans Commission, "America's Living Oceans: Charting a Course for Sea Change," May 2003.**

The commission describes the critical state of the world's oceans and recommends an ecosystem-based approach to future ocean management.

**United Nations Food and Agriculture Organization, "State of the World's Fisheries and Aquaculture 2006," 2007, [www.fao.org/docrep/009/A0699e/A0699e00.htm](http://www.fao.org/docrep/009/A0699e/A0699e00.htm).**

The FAO's latest official report on the state of world fisheries says a quarter of the commercial fish stocks have been over-exploited or depleted and about half are fully exploited.

**U.S. Commission on Ocean Policy, "An Ocean Blueprint for the 21st Century," 2004.**

The recommendations of a panel established by Congress echo those of the Pew Oceans Commission, while extending analysis to energy, environmental education and the issues afflicting the Great Lakes.

# The Next Step:

## *Additional Articles from Current Periodicals*

### **Commercial Whaling**

**“Commission Must Compromise for Sake of World’s Whales,”** *Canberra Times*, May 28, 2007.

The 2007 meeting of the International Whaling Commission serves as a reminder that commercial whaling poses political and financial questions as much as environmental and ethical ones.

**“Iceland Breaks Ban on Commercial Whaling With First Fin Whale Kill in 20 Years,”** *The Associated Press Worldstream*, Oct. 23, 2006.

Ignoring a worldwide moratorium that went into effect in 1986, Iceland announced the harpooning of an endangered fin whale — the first such killing in 20 years.

**“Too Much Blubber,”** *The Economist*, June 17, 2006.

The international moratorium on whaling seeks to conserve whales in the context of a commercial fishery, not to preserve whales for their own sake; therefore, it is reasonable for countries to reexamine the moratorium.

### **Ecosystem-Based Management**

**“Canada’s New Government Announces a New Approach to Canadian Fisheries,”** *CCN-Matthews News Agency (Canada)*, April 12, 2007.

The Canadian Minister of Fisheries and Oceans has announced a three-year, \$61 million investment in ecosystem-based science and the use of the data in fisheries-management decisions.

**Crowder, Larry, “The Oceans Need a Hand,”** *Los Angeles Times*, Aug. 6, 2006, p. A7.

Ecosystem-based management would allow scientists to diagnose all the problems affecting the oceans and not just those of individual systems.

**Richardson, John, “Excellence Is Key to Integrated Maritime Policy,”** *Lloyd’s List (England)*, Nov. 30, 2006.

Ecosystem-based planning can only work if coastal communities accept the necessary responsibilities.

### **Human-Caused Destruction**

**Corder, Mike, “Sewage Is Growing Problem for Coastal Populations, Environments, UN Report Says,”** *The Associated Press Worldstream*, Oct. 4, 2006.

Untreated sewage pouring into the world’s oceans is endangering people and animals, according to the U.N. Environment Programme.

**Perlman, David, “Greenhouse Gas Turning Oceans Acidic,”** *The San Francisco Chronicle*, July 6, 2006, p. A4.

A team of government-sponsored scientists has concluded that carbon dioxide is threatening destruction of shell-building

organisms that form the base of the entire marine food web.

**von Radowitz, John, “Crisis in the Oceans May Put Fish Off Menu by 2048,”** *The Western Mail (Wales)*, Nov. 3, 2006.

The current rate of pollution, habitat destruction and climate change threatens to kill off nearly all ocean species by 2048.

**Whitty, Julia, “The Fate of the Ocean,”** *Mother Jones*, March/April 2006, p. 32.

Ocean problems that were once encountered on a local scale have become pandemic, and even worse.

### **Ocean-Floor Trawling**

**“Greenpeace Urges Pacific Nations to Oppose Bottom Trawling”** *Asia Pulse News Agency*, Sept. 27, 2006.

The environmental group Greenpeace is urging Pacific island nations to call on the U.N. to establish a moratorium on unregulated high-seas bottom trawling.

**“Ministers Welcome Progress on Bottom-Trawling Regulation”** *New Zealand Press Association*, Nov. 24, 2006.

Despite the U.N. General Assembly’s failure to institute a ban on bottom trawling, the New Zealand minister of fisheries praises progress made toward regulating the practice.

**Christensen, Jon, “Unlikely Partners Create Plan to Save Ocean Habitat Along With Fishing,”** *The New York Times*, Aug. 8, 2006, p. F3.

The Nature Conservancy has agreed to buy fishing permits and boats from trawling fisherman in exchange for the implementation of three “no-trawl zones” off the California coast.

### **CITING CQ GLOBAL RESEARCHER**

Sample formats for citing these reports in a bibliography include the ones listed below. Preferred styles and formats vary, so please check with your instructor or professor.

#### MLA STYLE

Flamini, Roland. “Nuclear Proliferation.” *CQ Global Researcher* 1 Apr. 2007: 1-24.

#### APA STYLE

Flamini, R. (2007, April 1). Nuclear proliferation. *CQ Global Researcher*, 1, 1-24.

#### CHICAGO STYLE

Flamini, Roland. “Nuclear Proliferation.” *CQ Global Researcher*, April 1, 2007, 1-24.

# Voices From Abroad:

**FERNANDO CURCEO**  
Director, Fisheries  
Resources Department,  
Spain

## **We're trawling on sand**

"The EU and Spain maintain that this type of [trawling] measure would provoke illegal fishing activities throughout the world and there would be a proliferation of boats with flags of convenience. . . . We are not trawling over ecosystems that are in danger. But we're not prepared to tell our boats to stop fishing when there's nothing to protect."

*AP Worldstream, November 2006*

**YVONNE SADOVY**  
Biologist, University of  
Hong Kong

## **The wealthier, the fancier**

"The taste for fancy, novel, coral reef fish is spreading as wealth is spreading in mainland China. Countries must limit export quotas, create protected areas and encourage consumers to select less threatened species."

*National Geographic, April 2007*

**ASBJÖRN BJÖRGVINSSON**  
Chairman, Icelandic Whale  
Watching Association

## **Whaling provides no social benefits**

"There is no way whale hunting can be defined as sustainable industry. There are no economic benefits from whaling as there are no markets for the products.

And whaling is without a doubt damaging to Iceland's international image as a nature destination. It is hard to find any positive social effects from whaling."

*The Irish Times, October 2006*

**ALEX ROGERS**  
Senior Research Fellow,  
Zoological Society of  
London

## **Trawling burden must shift to governments**

"Our research actively demonstrates the vulnerability of deep-sea corals and their associated biodiversity to trawling across seamounts. . . . It is essential that the burden of proof shifts to governments and fisheries when deciding whether it is appropriate to exploit these irreplaceable ecosystems."

*The Independent (England),  
November 2006*

**PETE DAWSON**  
CEO, New Zealand  
Confederation of  
Commercial Fishermen

## **Trawling helps explore resources**

"Not only do we have a high exchange rate, high fuel costs and a depressed fish market — but now we've got the burden of reduced access to fisheries as well. [Trawling restrictions] deprive a nation of investigating and exploring its continental shelf for further resources."

*New Zealand Herald, May 2007*

**VALENTIN ILYASHENKO**  
Member, International  
Whaling Commission,  
Russia

## **Japan's whaling dilemma**

"Japan has big problems. Providing their traditional food is prohibited by international organizations, and I have no doubts that coastal whaling has analogies with aboriginal whaling."

*Kyodo News Service (Japan),  
May 2007*

**JULIAN CRIBB**  
Professor,  
University of Technology,  
Sydney, Australia

## **Put it in the hands of consumers**

"While the experts may argue about what is and isn't a sustainable fish stock, the idea of transferring the onus for protecting marine species to consumers, rather than fishers, is a good one. Fishers can hardly be blamed for trying to make a living, but consumers can always purchase and consume more

wisely, sending fishers the correct market signals."

*The Australian, February 2007*

**XAVIER PASTOR**  
Executive Director,  
Oceana Europe

## **Overfishing's domino effect**

"European Union vessels search for new fishing grounds further and further in the world's oceans because European waters are widely overfished. . . . We must prevent the same thing from happening in the Pacific."

<http://europe.oceana.org>

**USSIF RASHID SUMAILA**  
Researcher, University of  
British Columbia Fisheries  
Centre

## **Investing in fish brings returns**

"Rebuilding fish [stocks] is like putting money in an interest-bearing savings account instead of spending down the balance. If you grow the principal, you can live off the interest."

*PR Newswire, October 2005*



The Ottawa Citizen/Cam Cardow